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(54) Title: SWITCHES, SYSTEM OF SWITCHES, AND INTERACTIVE SYSTEM FOR USE ON ELECTRONIC APPARATUS

(57) Abstract: An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen and apparatus that are remote-connected to a screen or display means and for control functions in means of conveyance and transport and electronic equipment associated therewith. The operating device is centrally depressible and sideways tiltable, and its user-contact portion consists of a one-piece surface for both tilting and depression. When used on an electronic hand-held apparatus, the invention provides the known key logic which, together with new to ergonomics and a user interface, forms new and user-friendly apparatus and functions.

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SWITCHES, SYSTEM OF SWITCHES, AND INTERACTIVE SYSTEM FOR USE ON ELECTRONIC APPARATUS

- 5 The present invention relates to switch and keypad solutions and to an interactive system for electronic apparatus having a screen or remote-connected screen as disclosed in the preamble of attached independent patent claims 1, 10, 12, 15, 19, 23, 26, 32, 36, 38, 40, 44, 51, 53, 55, 60, 62, 65, 70, 77, 79, 81, 94, 95 and 100.
- 10 The invention represents an improvement of switches and keypad solutions, input of data for use by electronic, hand-held apparatus such as mobile telephones, PDAs, pocket or mini PCs, remote controls, calculators and the like, and for control units in vehicles and other means of conveyance and transport.
- 15 Switch solutions such as sliding switches, roller switches and rotary switches are described in more detail in Patent Applications PCT/NO99/00373, PCT/NO01/00057, NO20014305, NO20015872 and NO20021056. The interaction between user, keys or switches and screen, such as navigation in menus and the processing of data, also called graphic user interface (GUI), is described in the applicant's earlier publications
- 20 PCT/NO00/00412, NO20013231 and NO20020895. The invention will make use of this GUI, but will adapt it to the switch solutions disclosed in this application.

One of the problems that the invention is intended to solve is the efficient use of small hand-held apparatus. Modern technology has advanced so much that apparatus can be

25 made which are so small that many users are not able to handle them efficiently, in particular persons with adult-size fingers. In this description, reference will be made primarily to mobile telephones that are made so small that the keypad is no longer easy to use. Many fingers will quite simply be too large, and the user will have to carefully place a finger tip or a nail on one of the small keys so as not to press several keys at the

30 same time or slip onto the wrong key. The arrangement of the keys is not always optimal either, which makes it difficult for the user to strike the keys without having to follow the keying with his eyes every time. The input of text using today's keypads with twelve keys is particularly awkward and suffers from the limited solutions currently available. In today's technology, the principal losers are ergonomics and GUI,

35 which per se will hamper the further development of apparatus of minimal size.

- It is known that on a number of keypads several contact points have been placed under a collective layer. This must not be confused with what is to be described in this application, although at first glance it may appear to be known. However, the basic layout and logic are the same as for a "standard" numeric keypad for a telephone. What characterises these switches, and what characterises the Applicant's earlier switches is that the user does not need to lift his finger from the switch in order to enter data, but can tilt or press for the desired result without having to lift his finger. Thus, maximum ergonomic effect can be achieved for the use of apparatus having a solution of this kind.
- 10 Hand-held apparatus are also becoming increasingly filled with functions which, with today's keypad solutions, does not result in good user friendliness. Many hand-held electronic apparatus are in effect mini-computers. The present invention will also show how a keypad or keyboard for equipment requiring "standard" computer functions can be replaced by using a combination of three-position to five-position switches and
- 15 multifunction switches and an associated graphic user interface.

- In connection with known keypad solutions, reference will be made to US Patent 5528235 and US 6320942 which disclose respectively a keypad solution consisting of switches having five pressure or action points and an $8 + 1$ position activation matrix.
- 20 US 5528235 uses switches having "soft" contact technology which does not give the user any physical feedback when switch functions are activated. Contact for a centre switch is formed in that two or more of the peripheral contact points make contact at the same time.
- 25 US 6320942 is based on a system wherein "known" switch technology is used for the input of data, but does not present a physical solution for this. For the input of data other than numbers, as for instance text, the system requires the user to key twice for each data item, on a directional indicator element and on a key as represented by the desired data item, respectively. From WO9937025, it is also known that a single key in
- 30 a keypad may contain five positions for input of data. The switches in this patent document have a "soft" support which does not give any tactile feedback during use. The solution contains two modes for input of data. To go from the input of primary data, in this case numbers, to the input of data allocated to the peripheral positions of the switches requires a shift in mode by pressing on an extra switch. Detection of the
- 35 positions is effected by a field under the switch shorting different circuits as the switch is moved in different directions which, however, are not physically determined. Certain detection of the activation of a desired function does not seem to be provided for either

the solution in US 5528235 or that in WO9937025. WO 02063455 discloses a variant of that described in WO9937025, but where the switches are only joystick variants. For the input of more data than the five that are directly available, a double or triple movement of the switch in the direction in which the data is "located" is proposed.

5 The present invention represents a considerable development of the known key logic from that described in the Applicant's own earlier publications and those of others. Unlike the documents mentioned, the present invention represents new and improved switch technology and a simplified input system. Thus, the invention will facilitate in
10 particular the input of text as well as navigation and the use of different functions. Together with improved ergonomics and user interface, this forms the basis for new and operator-friendly, hand-held electronic apparatus and functions.

15 The characteristic features of the invention will be set forth in attached patent claims 1, 10, 12, 15, 19, 23, 26, 32, 36, 38, 40, 44, 51, 53, 55, 60, 62, 65, 70, 77, 79, 81, 94, 95 and 100, their respective sub-claims and the description given below with reference to the attached figures.

20 Tilting switch means, keypad solutions, switch solutions and their design and interactive use on electronic apparatus will be described and shown in the description and the drawings.

Figures 1a-l show the principle of a rotating roller switch; prior art.

25 Figures 2a-d show the principle if a rotary switch; prior art.

Figures 3a-g show the principle of a belt switch; prior art.

Figures 4a-c show the principle of a sliding switch; prior art.

30 Figures 5a-b show an apparatus provided with a sliding switch and a rotary multifunction switch.

Figures 6a-b show an apparatus equipped with a tilt switch solution and a rotary
35 multifunction switch.

Figures 7a-n are sectional and plan views of a tilt switch solution.

Figures 8a-d are sectional and plan views of a variant of a tilt switch and switch combination.

- 5 Figures 9a-c, 10a-c and 11a-c are sectional and plan views of more variants of tilt switches.

Figures 12a-j show surfaces for a tilt switch button.

- 10 Figures 13a-c show switch solutions in a natural configuration for use with a mobile telephone.

Figures 14a-c show the use of a tilt switch and a multifunctional switch.

- 15 Figures 15a-e and 16a-c show how light can be supplied in rotary switches.

Figures 17a-c show solutions for a five-way button.

Figures 18a-f show the layout of apparatus with tilt switch solutions.

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Figures 19a-o show contact points.

Figures 20a-k and 21a-c show the envisaged design of the graphic user interface in connection with a tilt switch apparatus.

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Figures 22a-g show apparatus equipped with only one tilt switch together with sliding, rotary and multifunction switches.

Figures 23a-h show apparatus equipped with a variant of the tilt switch solution.

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Figures 24a-i show the input of text for an apparatus equipped with a tilt switch.

Figures 25a-v and 26a-c show a graphic user interface during input for a rotatable roller switch having two tilt directions in interaction with two press switches.

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Figures 27a-d show a user interface in connection with a rotating roller switch.

Figures 28a-c and 29a-c show an apparatus for multifunctionality.

Figures 30a-b are schematic illustrations of an environment for an multifunction apparatus.

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Figures 31a-c illustrate an apparatus having a combination of tilt and press switches and a multifunction switch for carrying out computer-related functions.

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Figure 32 shows an embodiment in which the operating devices in the keypad part have four functions.

Figures 33a-f illustrate apparatus equipped with a combination of operating devices with press for all functions on the surface and a multifunction switch, for carrying out computer-related functions, whilst Figs. 33b-f illustrate an input situation.

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Figure 33g shows a keypad solution used in connection with predictive input of text.

Figures 34a-h show different forms of operating devices.

Figure 35 shows an embodiment of an operating element.

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Figures 36a-b show a hand-held apparatus equipped with operating devices for computer-related functions where it is shown how to handle the equipment.

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Figures 37a-b show interactive use of operating elements together with a rotary multifunction switch.

Figures 38a-b show interactive use of operating elements together with a rotary multifunction switch of the roller type.

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Figures 39a-b show interactive use of operating elements together with a rotary multifunction switch of the belt type.

Figures 40a-b show interactive use of operating elements together with a stepwise slidable multifunction switch.

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Figure 41 shows an alternative for the use of multifunction switches.

Figures 42a-b illustrate an apparatus which contains a multifunction switch and a touch screen.

Figures 43a-c show an alternative solution for the use of a keypad and a multifunction switch in a functional apparatus.

Figures 44a-b show another alternative solution for the use of a keypad and a multifunction switch in a functional apparatus.

Figures 45a-c show another alternative solution for a keypad for a functional apparatus.

Figures 46a-d show yet another alternative solution for use of a keypad and multifunction switch in a functional apparatus.

Figures 47a-d show the construction of a tilt and press switch for use in a keypad.

Figures 48a-b show the use of a switch.

Figures 49a-d show an alternative to a tilt and press switch for use in a keypad.

Figures 50a-e show multifunction apparatus where a screen may cover parts of the keypad.

Figures 51a-e show the construction of a tilt, press and rotary switch.

The following description will explain the invention primarily in connection with a mobile telephone. This must not be regarded as limiting since all electronic apparatus equipped with a screen or connected to a screen can make use of the invention. However, it should not be understood thus that the switches have to be related to use in connection with a screen, but can be used for functions in a system of one-to-one functions.

Vehicles and other means of conveyance can make use of the invention for control functions and in connection with non-vehicle related functions in the means of conveyance. In connection with vehicles, reference is made to the earlier international patent application, PCT/NO01/00056.

Figures 1-4 show prior art, taken from the Applicant's earlier applications. This art is included for the understanding of the invention and the ideas that combinations of different switch solutions give for the user interface in different electronic equipment.

Fig. 1 shows a rotating roller switch 1. This solution is known from earlier applications with the same inventor, including PCT/NO01/00057. The figure shows how this art can be combined with standard press switches in order to obtain the desired degree of functionality. Figs. 1a-b show the solution with tilting positions 3' and 3''' and press 3'' and rotation 5. Figs. 1c-d show how tilt points can be replaced by separate lateral switches 7'-7'', 8'-8''' . Figs. 1e-f show a tilt switch in the form a narrow wheel 9. As can be seen from Figs. 1j-l, the functionality of a three-point roller switch will be the same by moving pressure points to the side of the switch, where Fig. 1l shows the tilt and press switch variant that is described in more detail in connection with, e.g., Figs. 7-14. Figs. 1g-i show a variant of the rotary tilt switch without the option of central depression. The system in connection with some of these combinations is disclosed in the international patent application PCT/NO00/00372.

A rotary switch with functionality for five pressure points is shown in Fig. 2. Fig. 2a shows a rotary switch with a one-piece button 10 and underlying switches 14-14''' , whilst Fig. 2b shows that a central part 12 can be pressed or moved without actuating the rotating part 11. A variant of these switches may contain technology for measuring deviation from a central position in order to freely move a cursor on a screen. Figs. 2c-d show a variant where switches 16'-16''' are external to the rotary button and thus replace the tilting function of the switch.

Fig. 3 shows a rotating belt switch with variants of pressure points. This is also prior art from the Applicant's earlier applications. Two rotating rollers 19-19' are connected by endless belt 20 passing around them. The switch may have from zero to five press or tilt points represented by 22-22'', and crosses in Figs. 3c-g.

Figure 4 is intended to show the principle the invention will use in connection with an interactive system, also called a graphic user interface. This is prior art as disclosed in the earlier international patent applications PCT/NO99/00373 and PCT/NO00/00412. The figure shows how by using a switch it is possible to replace twelve switches for functions, as is usual for apparatus which employ a numeric keypad, for example, in a mobile telephone. A switch 25 has a stepwise sliding movement and is also a centrally depressible and tiltable to both sides. Table 27 shows a typical layout for a twelve-

button numeric keypad. The alphabet is also distributed among the available keys. The switch 25 will have press and tilt positions X1-X3 available for each Y position. The number of Y positions should not be regarded as limiting. It should be understood that all the switches which have sliding or rotary movement and at least three press positions could make use of this system. Fig. 4c shows what a screen image 30 may look like for input of letters where the alphabet can be rotated, or moved by stepwise movement of a sliding switch, into the fields 32-32".

Attention will now be focussed on the core ideas of the invention. Sliding and press switch 25, as shown in Fig. 5, requires a good deal of mechanics and may be regarded as expensive to use in consumer electronics although it could minimise the area of the keypad. If the sliding positions are "frozen", it will be necessary to replace each position with a press and tilt switch 34. This gives a solution with fewer movable mechanical parts, but the same user interface as for the sliding switch 25. The reference numerals 35 and 37 refer to the addition of press switches. The reference numeral 38 refers to a rotary push switch. The length of the tilt keypad shown in Fig. 6 will be limited by the finger's ability to distinguish between the switches. This is shown in more detail in connection with a design for optimal ergonomics in connection with Figs 12-14.

Figs. 7a-e show a design of a tilt switch. This switch is made so that on depression in the centre the user will obtain a definite click and contact. The switch will not tilt to the side once the user has started a vertical movement of the switch. A side tilt or press out towards the edge of the switch will give contact with right and left contact points. A press in the centre of the switch 40 will move a pin 42 towards a spring 44 which results in contact with contact point 45 on a circuit board 47. A tilting part 46 has "arms" which collapse the springs 44'-44" and form contacts as indicated by 45' and 45" when the user tilts or presses against outer edges of the switch button 40.

Distribution and resistance of springs in the switch constructions is such that an exertion of more than 50% force at the desired point will result in activation of function at only one of the contact points.

It is essential that the design of the switch button 40 surface should give the user a secure feeling so that movement of the finger results in definite tilting and pressing. This is achieved by depressions 50 as shown in Fig. 7a, or raised portions 52, Fig. 7b.

Figs. 7d-e show section VIId and section VIIe as indicated in Fig. 7b. Figs. 7f-g show switch surfaces. Here, reference should also be made to Fig. 12.

The switch surface 54 can be designed so that the tilting keypad seems to have the appearance of a conventional keypad. Sections of this are shown in Fig. 7c. See also Figs. 18d-e. The above solution has all contact points in the same plane. The switch solution shown in Figs. 7h-i has contacts points 56'-56" and springs 58'-58" for side tilt arranged vertically. Activation takes place in that the tilting part causes collapse of the springs. Depression triggers contact in that a pin 62 causes a spring 58 to collapse. An alternative construction consists of passing a shaft 55 through pin 62 to form an axis about which the operating device can tilt. This solution will activate a switch function in the opposite direction of the side to which the operating device is tilted.

An alternative way of arranging springs and contact points is shown in Figs. 7l-n. In these figures, springs are arranged in a triangle and a stopper 59 is located between the springs 57' and 57" so that when the user presses on the centre of the operating element activation of the switch function at 57 is triggered.

In order to obtain a definite central press and side tilt, the following alternative mechanics will be described in connection with Figures 8-11. A switch as shown in Fig. 8 has a switch element 64 that is depressible and which, when tilted, moves tilting element 65. This is more or less the same principle as for Fig. 7, but in this case the two movable parts are supported by a through-going shaft 61. The tilting element is only tiltably supported about the shaft. The springs are represented by reference numeral 63. Figure 8a shows the section VIIIA-VIIIA, 8b shows the section VIIIB-VIIIB and Fig. 8c shows the section VIIC-VIIC. Fig. 8d shows a solution where a plurality of switches are placed in a row to form a keypad for 3 x 4 tilt and press positions. The number of switches in a configuration of this kind must not be regarded as limiting for the invention. For this solution, the shaft 61 will be so long that it passes through all the switches.

The switch element 66 as shown in Fig. 9 is biased by a spring 68 which is located between the switch element 66 and a bridge 70. The switch element is also secured by two shafts 72-72' which pass through elongate holes 74-74'. The switch element is tilted about the shafts which also gives a definite central press shown in Fig. 9a. Side tilting is shown in Fig. 9b where activation of two contact points gives a signal regarding side tilting. Contacting can either be done by springs against contact points or

as shown here and indicated by 76 as a contact film. Fig. 9c shows the layout of contact points 78-78" and the position of spring 68.

Figures 10a-c show another variant of a tilt switch. In this case, the switch element 80 is fastened to a cup spring 82. Pins 84-84' on the underside of the switch element will give contact on the contact film 86 when spring 82 collapses on central pressure, Fig. 10a, and on side tilt, Fig. 10b. The pins 84'-84" are so positioned that they do not give contact on the film on central pressure, Fig. 10c shows the layout of contact points 88-88" and the position of spring 80.

Figures 11a-c represent another mechanical solution for a tilt and press switch. The switch element 90 rests against a spring 92 which, when the centre of the switch is pressed, will collapse and contact circuit board 94. The switch element 90 is in engagement with a tilting part 96. A centre press will cause the switch element to slide and not actuate the tilting part. A side tilt will cause the spring 92 to keep the switch element in engagement with the tilting part and cause this to collapse one of the springs 92'-92". This gives contact on the underside of the circuit board 94. The contact takes place on the "wrong" side of that towards which the tilt is made, but this is corrected on the circuit board and/or in the necessary software so that a right-hand tilting movement which gives left-hand contact will nevertheless give a right-hand result in the user interface. Fig. 11c shows the layout of contact points 98-98" and the position of springs 92-92".

As previously mentioned, the design of the switches will be important for the use of the tilt switches and the whole tilt switch keypad and to give an overall ergonomic solution for the equipment that it is to be used for and the apparatus in which the solutions are to be included. Fig. 12 shows different designs of the switch surface. Fig. 12a shows a switch surface consisting of three circular raised portions, whilst Fig. 12b shows a switch surface having three oval depressions. Fig. 12c shows the surface consisting of three curved forms having longitudinal bevelling. Fig. 12d shows curved depressions on the surface. Fig. 12e shows a flat surface with a curved projection in the middle, whilst Fig. 12f has a curved depression in the central portion. Fig. 12g shows a switch surface having three separate flat raised portions. The raised portions have a certain vertical spacing which makes it possible for an apparatus cover to partly conceal the switch, and give an appearance as shown in Fig. 18e. Fig. 12h shows a variant with short raised portions. Fig. 12i shows a variant of that shown in Fig. 12c, but where the

raised portions are tapered vertically. Figure 12j shows projections on the operating device in the form of squares to give the appearance of a keypad as shown in Fig. 18d.

As mentioned earlier, one of the main points of this switch design is that it replaces groups of three press switches. The advantage of the tilt keypad is that the contact points can be placed closer together than in a standard numeric keypad where there is a plurality of separate buttons. This means to say that if separate buttons are arranged as for a standard keypad and as close as in the tilt keypad shown here, the user's fingers will not manage to avoid pressing on several buttons at the same time. If the tilt keypad is to be easy to use, it is important that the switches and the apparatus should have the correct ergonomic design. This is done so that one of the digits of the hand, for example, the thumb, can be moved as little as possible to obtain the desired switch effect.

Figure 13 shows a typical design of an apparatus equipped with a press and tilt keypad. The design of the keypad is made so that it is easy for the user to use the thumb which holds the apparatus during use. The thumb is moved up and down over the keys which are made with grooves and projections. This can be seen more clearly in Fig. 14. An apparatus such as that shown in Figs. 13a-c represents a small electronic apparatus with a screen, for example, a mobile telephone, that can be held in the hand, between the fingers, where the thumb is used to operate the keypad and switches. An apparatus with tilt keypad, press switches and a multifunction switch in the form of a rotating cylindrical switch 100 is shown in Fig. 13a. Fig. 13c shows a solution wherein the multifunction switch is in the form of a rotatable press and tilt switch 102. Figure 14a shows function and press possibilities for rotary switch 104, whilst Fig. 14b shows how rotary roller switch 106 will work. The principles of this have been explained in connection with Figs. 1 and 2 and as previously mentioned, documented in the Applicant's earlier applications. The tilt keypad is so designed that a thumb or finger will easily feel the central portion of the keypad and the transitions between each tilt switch and feel the tilt points for each individual switch 110, as indicated by the arrow at 108.

An apparatus with a keypad solution of this kind described may be made extremely small and contain many functions, but will nevertheless be simple to use because of the design of the keypad, the construction of the switches and the interactive use.

An apparatus with a switch solution as shown would have to have some illumination to be capable of being used in poor lighting. A challenge is to include illumination for the

rotary multifunction switches which in this case will be an important part of the apparatus. A solution as shown in Figs. 15 and 16 can be obtained by using transparent material and fibre optics. These figures show a section through a rotary switch wherein light is supplied via a transilluminated ring 112 that is fixed around the switch element 114. The switch element 114 is of a transparent material, but part of the surface is covered, as illustrated at 116. The sides are "open" to admit light, and the central portion to let light out. Ring 112 is supplied with light from light element 118. This may be the same light source that illuminates parts of a display. On the ring, we can place markings for the tilt positions, or cover the part between the tilt markings. It is conceivable that separate light points 120-120''' may also be placed directly below the switch construction as illustrated by Fig. 12e.

How illumination of rotary roller switches is provided is illustrated in Figs. 16a-16c. Transparent and illuminated rings 122-122' lie on either side of the switch. The reference numeral 124 indicates a light source. The switch 126 is of a transparent material, but is covered except at the markings 130. The reference numerals 121 and 125 indicate light.

Fig. 17 shows the construction of a five-way tilting switch that is used in connection with the keypad solutions disclosed in this description. The mechanics shown in Figs. 17a-c are based on that shown in connection with Fig. 7. The reference numerals 140-141 refer to springs and contact points. Figure 17c shows how such a switch can, when pressed, activate X1-X3 by pressure and sideways tilt, whilst movement in the direction of the arrow will change the data shown in fields on the screen in order thus to vary the amount of data that the equipment of which the operating element is a part, requires. This means that input of data can be used in connection with this type of switch, in a similar way as will be shown in connection with, for example, Figs. 33-36.

Fig. 18 shows basic designs of apparatus equipped with tilt switch keypads. The keypad 150 can be manufactured so that each tilt switch has a characteristic shape, and that the switches have a distinct space therebetween, Figs. 18a-b, or are close together, Figs. 18c and 18f, or are partly concealed under a cover as shown in Figs. 18d-e, which gives the impression of a "standard" keypad. The tilt keypad may also be made in various ways without "following" the lines that the underlying contact points would naturally indicate. Fig. 18f shows how the switches which are basically identical, have each been given a characteristic shape on the surface. Reference numeral 151 refers to extra switches and/or to multifunction switches that are used in connection with

additional functions such as navigation and special commands on the apparatus. Fig. 18f shows a variant where the switch surfaces each have a special design in order to create a common design for the whole keypad. The tilt switch keypad may thus contribute to a new and exciting design for hand-held electronic apparatus and equipment.

A tilt switch keypad in combination with navigation switches, multifunction switches and "standard" press switches gives many different possible combinations. Many different configurations are illustrated in Fig. 19 where contact points are marked as black dots 160. Figs. 19a-e show a tilt switch keypad in combination with a rotatable press and tilt switch 162 and standard press switches. The number of presses and tilts for the switch 162 is shown as being from zero to five. Figs. 19f-j illustrate a tilt keypad in combination with a rotatable roller switch 164, and Figs. 19k-o show combinations including belt switch 166.

Figs. 20 a-k show apparatus with tilt switches 170 in combination with multifunction switches and press switches on a typical hand-held apparatus with a screen, as for instance a mobile telephone or a mini-computer. The multifunction switch will be a rotatable press and tilt switch 172, see Fig. 20a, rotatable roller switch 174, Fig. 20b, belt switch 176, Fig. 20c or a five-way joystick switch 178, Fig. 20d, all with the possibility of a combination of press switches 180. It is also possible to choose to combine tilt keys with arrow keys 182.

Tilt switches 170 are intended for direct input of numbers, letters and symbols. In this connection, the switches 172-182 will primarily be used for navigation of a cursor 184 or 186 on a screen, for browsing through data lists, choosing between different icons and other data on the screen. Switches 180 represent commands such as YES/OK and No/Back/Clear. It should be pointed out, however, that these functions can be assigned to the multifunction switches. The Applicant has also described in his earlier applications how the multifunction switch can be used for input instead of using a press keypad with silk screen print on the surface. This possibility could nevertheless be available so that the user can choose the system and the switches he wishes to use for the input of data. It will also be possible to make an apparatus where a cover protects the tilt switches, but where the multifunction switches are accessible. Thus, the user can choose which system he would like to use. Figs. 20f-k show an example of an apparatus which is the size of a mini-PC or PDA, with a switch combination as described above. Fig. 20k indicates the many functions an apparatus of this kind may

contain, here indicated by icons on the screen 175. Reference numeral 177 indicates the position of one of the previously illustrated multifunction switches for navigation and other function control. A more detailed description of multifunctionality of the apparatus will be given in connection with Figures 28-29.

How the graphic user interface is envisaged for apparatus with a "big" screen is evident from Figure 21. This figure shows a menu down which a cursor can be moved by rotating switch 192. A field 196 faintly shows a sub-menu for the selected function. Selection is effected by pressing on 192 or side keys 193 or 194. The sub-menu becomes clearly visible and the user can move the cursor across the menu using switch 192. Confirmation is effected by pressing on switch 192 or 194. Figs. 21a-c show an example where the user selects telephone function 200, in order subsequently to enter a number. The tilt switch keypad 204 is then used in a known way for input of a number in field 202.

Figures 22 a-g show an apparatus consisting of a tilt switch and a rotatable switch of the type shown by 208, 210, 212 or sliding switch 214, or joystick switch 216. An apparatus with simple functions will be able to manage without any form of standard keypad if it is able to effect a vertical and horizontal movement of the cursor on the screen and a confirmation or negation function. As previously described by the applicant, the multifunction switches described here can handle all functions that are usual in, for example, a mobile telephone. However, this requires an interactive graphic user interface as also described by the Applicant. If it is assumed that sliding and rotary switches as shown here have only one function (for example, only rotation), the addition of a tilt and press switch could provide sufficient functions as it will take on the possible press functions that the multifunction switch could potentially have. Figs. 22f-g show an apparatus having a five-function joystick switch which will work in interaction with rotary switches, illustrated in these figures as roller switch 215 and a rotary switch 217 in the form of a ring.

An apparatus which combines switch 218 and 219 is shown in Fig. 23. The switches will be of the type described in connection with Fig. 17. Switch 218 is known from, e.g., Ericsson T68. Switch 218 has four possible tilt functions and a central press function, whilst switch 219 will also have a central press function but only two side tilt functions. The switch buttons will in this case have a small area so that the marking 221 will to a great extent have to be located on the apparatus housing 220. Figs. 23b-f show menu use for a five-way joystick switch. The screen 223 in this case is divided

into 3 x 5 fields. The number of fields in the y direction may vary. By moving 218 in the y direction, the user will move the cursor 224 in the y direction and mark three fields in the x direction. By pressing on the centre of the switch, the user will choose the central field and content thereof and thus open the functions and any sub-menus as shown in Fig. 23e. To go back, the switch is moved to the right to carry out the function No/Back. A switch like that described here will, in a menu or function that does not require right and left navigation, or selection, have these functions for confirmation 226 or negation/back 228. Figs. 23g-h show known movement of the cursor on the screen, but by using this system it can move to a preceding menu or system shown by Figs. 23 e-f.

The input of text using a combination of a rotatable roller switch and tilt switch keypad will now be described in connection with Fig. 24.

Fig. 24 shows an apparatus with a tilt switch keypad 230, rotary roller switch 232 with tilt and press functions, and press switches for Yes 233 and No 234. In Fig. 24a, the screen 236 shows twelve squares which represent symbols for different functions. Screen size or number of fields in the y direction is not limiting for the apparatus. Rotation of switch 232 represented by the arrow 238 will cause a cursor 240 to move in the y direction across three fields. To select one of the fields, the switch 232 is pressed in the centre, to the right or to the left. In Fig. 24b the left field is selected and the switch is pressed/tilted to 242. A sub-menu appears as illustrated in Fig. 24c. Rotation allows a user to move in a known way in the y direction through the menu.

Below will follow a description of the system and method for the input of text.

The mode for text messages is selected, Fig. 24d, input of text for the message. In this case, the apparatus contains a predictive system for writing text. This system is known from the Applicant's earlier applications relating to multifunction switches. The word "Telenostra" is to be written. The tilt key is tilted at 244 and the predictive system chooses the most frequently occurring word that begins with "s". By pressing on 244, the user again chooses the most frequently occurring word beginning with "t". There is a slight time delay before the letter becomes "fixed" in the message. This is to enable the user to switch between the letters and symbols that share the same key position. This is known from existing mobile telephones. The word the system selected is wrong but the user simply continues to enter the next letter "e".

However, the system functions so that even if one of the other letters comes earlier in the alphabet, it will predictively guess the letters of those available on the switch which has highest ranking in the "memory's" word list. In the illustrated case, the system jumps over "d" at the first press as it has "Te" as a high-ranked alternative. "Telenor" is now written as this is at the top of the list. On the screen image a number 246 emerges at the input of the first letter. This number reflects how long the word list of predictive options is. "Telenor" is not the desired word either in this case, but the user may choose to see the word list. However, it is 90 words long and so the user must choose the fastest solution. Here, we choose to enter the next letter "l". Although "Telenor" contains "l", the word will disappear and the system chooses the next word that has "l" as the third letter and suggests "Telephone". We find that this is also wrong, but now there are only seven choices 246 left in the word list. The system is made so that if the user wishes to look in the word list, he starts to rotate switch 232 and the word list 252 will appear on the screen. The user can then in a known way move a cursor across the alternatives he is given and select the alternative he desires either by using a yes/ok function button or a confirmation function in the rotary switch itself. If there is a limited screen area, the system will obtain the word the user is in the process of writing by looking through the list without the list being visible. Any one of the multifunction switches mentioned in this application may be used as a multifunction switch for this system.

Fig. 25 shows a user interface in connection with input for a rotatable roller switch having two tilt direction in interaction with two press switches. In this case, a rotatable switch 260 has only a tilt function. In addition, the system is designed to function in interaction with a press switch 262 for the "back" function and a press switch 264 for the "OK" confirmation function. In a start mode, the screen 268 may consist of a menu 270 visually presented as symbols for different apparatus functions. Navigation in the y direction is done by rotating the cylindrical switch and thus moving a cursor. The cursor is moved in the x direction by tilting the switch to 273 or 274. After a function has been selected, the user will, in an input situation, obtain a field for input 276, a field for function information 278 and a field for options 280. Field 280 will consist of, for example, numbers, letters, symbols and function options. Figs. 25b-c shows field 280 with the choice between letters or numbers. Figs. 25d-e show an alternative layout which means that after the first selection, in this case AB in field 282, these are marked, in this case highlighted in a field 284, and the user can then choose between the two letters by tilting the switch. Another way of entering data is shown in Figs. 25f-i, where the user wishes to type "Do". In this case the alphabet is split into three choices at a

time. The user must press three times on 273 to obtain the letter "D". In these figures, this is shown with a predictive system. If the word "Does" had been right, the user could have pressed OK at 264, but here the user wishes to enter another word and so he rotates the switch to obtain the required letter group and the letter "O". Although the guessed word contains "O", "does" will not be shown predictively on the screen again after the entered letter even though it contains an "O". Without a predictive system, the user would have to key twice at 273 to obtain an "O". Figs. 25k-n show the input of numbers. This mode represents the function for entering telephone numbers. Here, the screen is so large that all numbers from a standard keypad are set out on the screen. In this case, pairs of numbers are marked by 286. By tilting the switch 260 at 273 and 274, the user will be able to move the cursor to the left and the right respectively. From Figs. 25k-n, the switch is tilted to the right and moves the cursor to the right. A further tilt will cause the selected field 288 to be highlighted and the user can with a tilt choose between the two numbers then visible in the field. In this case 3 is selected by a tilt to the right and the number appears in a separate result field 290. Figs. 25o-s show a variant of the input of text as described in connection with Figs. 25f-j. Here, the alphabet is distributed both to the right and the left in field 280. Figs. 25t-v show that direct functions can be placed in connection with the data used for input. Here, the rotation function is used to find the direct functions that are available.

Fig. 26 shows a variation of Fig. 25 wherein a field 294 only contains one row of data. Additional data appears successively in the field on rotation of the switch 296. The keys 262 and 264 as shown in Fig. 25 can be replaced by switch 298 in the form of a tilt switch.

Navigation using a roller switch with centre press and side tilt will now be described in connection with Fig. 27. This figure shows an example of navigation across a screen showing a section of a map. Here we have a cursor 300 which can be moved in the y direction by rotating the switch 302. For movement in the x direction, the user first presses 304 which thus activates rotation of the cursor in the x direction. A centre press 306 activates a zoom function. The system has an alternative way of using this type of switch. Rotation will always be connected with movement in the y direction, whilst tilting to the right or left gives direct stepwise movement of the cursor in the x direction. The system can also be used in connection with a rotary disc switch as shown in Fig. 2 and for a belt switch as shown in Fig. 3.

The switch solutions described above together with an interactive system give untold possibilities for apparatus with many functions, i.e., multifunctional apparatus. Fig. 28 shows symbols, also called icons, for a selection of functions an apparatus may contain, or control via a wireless connection. The symbols may represent main groups of functions, or sub-functions for direct access. Figure 28a shows symbols for the following functions: telephone 310, address book 311, mail 312, reminders 313, notes 314, log-on for e-mail services 316, log-on to Internet 317, log-on to the mobile telephone's wireless Internet variant, WAP and other log-on services 318, calendar 319, music (CD/Mp3) 320, film 321, TV 322, radio 322, calculator 324, drawing tools 325, photos 326, games 327, picture collection 328, various tools for settings, connections, downloading, sending and other apparatus-related main functions 329, vehicle functions 330, arrows showing additional functions, house and home functions 332, video/live pictures 333 and computer 334. Figure 28b depicts an apparatus with a screen 338 showing a plurality of symbols for functions. Navigation among these functions and selection from among them can be effected using one of the multifunction switches as shown, for example, in connection with Fig. 20. Keypad 342 consists of four tilt switches like those already described. Fig. 28c makes it clear that the size of the screen does not limit the number of functions. By using a multifunction key with a navigation function, the user will be able to move the symbols around on the screen image. In Figure 28b, the space problem is solved by installing an arrow symbol 331 which when activated fetches up additional symbols. Figure 29 shows how the tilt switches 342 can be used for activating functions represented by symbols on the screen. None of the switches are marked but have functionality according to the pattern shown on the screen. Here, there are 3 x 4 symbols according to the pattern of the press and tilt positions of the switches. The functions of the switches will at all times be apparent from the screen image. Figure 29a shows a screen image with 12 functions, where by activating position 348 for telephone, the user brings forth a main menu for functions that are customary today in connection with mobile telephones. Additional functions are obtained by activating 350. However, in this case the ring function is chosen and input of a number can be done by using the tilt keys in accordance with the pattern shown on the screen as illustrated in Fig. 29c.

To have a more detailed overview in connection with multifunctional apparatus as described in particular in connection with Figs. 28 and 29, reference is made to the schematic presentation in Fig. 30. The apparatus shown in Fig. 30b contains the following technology for controlling and processing different functions:

- radio part for telephone 360

- satellite receiver and transmitter 361
- AM/FM radio 362
- Bluetooth™ 363
- Infrared transmitter/receiver 364
- 5 - Data processor 365
- Computer programs 366
- Data storage and memory capacity 367
- Screen 368
- Power source 369
- 10 - Loudspeaker 370
- Microphone 371
- Input and navigation switches 372.

Anyone skilled in the art will see that the apparatus does not need a screen if connected
15 to equipment that has one.

If the user selects a function represented by 360-372, a sub-menu for available functions
will be shown on the screen. In the menu "house" 376 the following functions will be
available, and are then remote-controlled from the apparatus:

- 20 - Alarm 381
- Gates, doors and locks 382
- Lights 383
- Radio/stereo 384
- TV/video 385
- 25 - Heating and ventilation 386
- Curtains 387
- Fixed telephone 388

These functions will then be shown on the screen in a submenu. The functions which
30 involve physical movement will be connected to a motor by remote control for the
carrying out thereof.

When a function is selected from the main menu, the apparatus will know whether it
should connect to external equipment or whether the functions are found in the
35 apparatus itself.

A multifunction apparatus as described, in particular in connection with Figures 28 and 29, consists of a type of PC part comprising a microprocessor with storage capacity and software. This makes it possible to install upgrades and software for controlling additional figures. This means that the apparatus can be tailored to operate the functions the user wants, or to adapt the functions according to the user's needs.

Today, hand-held multifunction apparatus contain either an almost complete keypad or pressure-sensitive screens. Both parts are dependent on the user using both hands on the apparatus. The following will show that a combination of multifunction switch and a keypad consisting of 12 press and tilt switches could easily replace a complete keyboard for a computer. The solution is made so that it can be used with one hand.

As regards the interactivity and functionality of the multifunction switches, Figure 31 shows a hand-held apparatus which contains communication and computer functions. Unlike what is found today, each key 406 in the keyboard the part 407 has five unique press and/or tilt positions that relate in a normal mode to what is marked on the actual switch. Mobile telephones, multicomunicators, PDAs and the like have either a complete keypad or switches with a list a several functions that must be clicked through if the apparatus do not have a pressure-sensitive screen. Multifunction switch 402 is a rotary roller switch with press and tilt functions. Rotation moves cursor 409 on the screen. Field 412 shows at all times press and tilt functionality for the multifunction switch. The multifunction switch may also be of the type shown in Figure 2 or 3. The switches 408 and 408' give direct access to direct functions. The switches in the keypad 407 are depressible and tiltable in four directions. The construction of the switch follows principles as shown in connection with Figs. 7-8 and 17. The press function is marked on the key whilst the tilt functions are marked on the apparatus at either side of the key. The keys may be replaced by the type shown in Figures 32-34. In these figures, the keys have a larger surface and permit marking of all functions directly on the key. Figure 31b shows a solution where there are only three tilt directions. Figure 31c shows a solution where around the central press position there are four surrounding switches that are activated by being pushed towards the central switch. Figures 32a-c show a solution where the keypad part 407' consists of keys 405 having four functions, i.e., one press and three tilt functions. The keys may consist of a one-piece face which can be pressed and tilted in three directions and where the marking is placed directly on the surface. As described in connection with Figs. 31b-c and 32, the key may be of the type that is tilted and pressed, but in this case limited to three directions.

Figure 33a shows an apparatus for communication, computer-related functions and other possible functions for hand-held equipment, where the keypad part 416 consists of twelve press and tilt keys. In addition, the apparatus has a multifunction switch 418 which can be rotated for navigation in the screen area 420 by, for example, moving a cursor 417 across the different symbols for functions. Here, there are at least two ways of selecting a function by moving the cursor. This is done either in that functions, represented here by icons, are marked or activated one at a time by a centre press on the switch 418, or that the cursor moves across several icons simultaneously from which one must be chosen by a press on VI-VIII. Field 422 shows press functionality of the switch 418 which in this case is of the same type as previously shown in connection with, e.g., Fig. 2. Keys 424 and 424' have direct main commands. The keypad part 416 contains twelve keys, each having five different press positions for activating switch functions. The keys have marking directly on the switch and the marking is positioned so that it indicates the press positions. Numerals I-V indicate press positions. A press in the centre I of the switch will cause the function or the data item assigned to the switch to be activated. Pressing/tilting of I-IV gives input of additional functions. The reference numeral 403 indicates a means that controls functions during the input of text and its predictive properties. The means will consist of computer components such as a processor, memory and software.

In, for example, a telephone mode, or another mode which only requires numbers, any press on the switch will give the number as indicated in the central position of the switch, at V. In a normal data function, all functions will be active.

With the apparatus as described in connection with Figures 31-33, the user will in the keypad part 407/416 have directly available 60 functions and/or data items such as numbers, letters and symbols. In addition, with at least one multifunction switch, the user will have additional functions such as navigation in the screen image.

In the following an example will be given of how input of text works when using that described above in connection with Fig. 33. The system uses a predictive solution which is based on that previously described by the Applicant. Fig. 33b shows the screen image of the apparatus in a write mode. Here, the functionality of the operating device 418 is also shown in field 422. We wish to write "Phone my mother", We use switch "4" and press on position IV. The system chooses a word from a word list based on the word that is most used and that begins with m, n, o or p. Of course, the system can be made in a known way in that it only chooses from among the words that start

with the letter selected by the user. In this case, the predictive system is based on options from among the letters that each operating device represents. Fig. 33b shows that the system has selected "Paper". If the screen size allows, the system can show the words that are arranged under the chosen word indicated by the reference numeral 413.

Here, the user has the possibility of either rotating switch 418 in order to navigate the cursor 415 for selection of the right word, or of pressing on "4", position IV, in order to confirm the letter P. Here, the system can either be such that a new word beginning with P will appear predictively, or that the system waits until the input of the next letter has been carried out. In any event, the user will in this case select the right word from the list 413 and the word "Phone" appears on the screen. Key "0" is pressed at IV for a space. If the correct word appears, the user can confirm this by pressing "Spc" here, or "enter" using switch "#". If the wrong word appears, the system can be made so that when key * "Alt" IV" is pressed, the next word in the list will appear.

"My" is to be written and key "4" is pressed and the word "me" appears, see Fig. 33c. The word is wrong, but the first letter is correct. In this case, we do not take the word list into account, but press position I on key "4" for confirmation of "m", and then key the next letter "y" using key "7". Display of the word list can be selected by the user himself if he so wishes. The following figures will not show the list in the screen image, but it is obvious to the skilled person what it would look like. The predictive system then chooses between the alternatives that are found on the basis of its word list for the word that can be formed. Now "my" appears, which is the word that is sought. The example is not particularly good, but if the user was to have written "myself", he could have easily chosen the word from the list. Key "2" is pressed and the word "everywhere" appears. This is not the right word, so here the user can either enter the word list, or press II on key "2". We then press "1" and "father" is chosen as the word we are looking for. If an advanced language program with automatic correction and correction for natural words in sentence structures is made, writing with this system would be very easy.

That which is to be described in connection with Fig. 33g is a variant of that shown in Figs. 33a-f. Here, we have an apparatus with a keypad 416 consisting of switches 415 having five press and tilt positions I-V. A press on one of the positions of the switches will cause a particular data item to be displayed on the screen as shown in Fig. 33g, where S has been selected. The next data item is selected, in this case X. However, the system is such that "impossible" combinations are corrected. As a word starting with SX does not exist, the system chooses another letter from the four possible letters on the

- switch in question, in this case U, and suggests "Sugar". That means to say that if the user presses on the wrong point on the switch, the system will correct this mistake by analysing whether the combination gives an impossible result and then choosing a more likely combination on the basis of the other data items that are available on the same switch. The result as proposed by the system may either be confirmed by a space "Spc" 411 or another position on the multifunction switch 418. Alternatively, the user may reject the system's suggestion by pressing on the back or clear function or by continuing the input of data items.
- Figures 34a-e show a different form of switch where functions are printed directly on the surface. Figure 34f shows a switch that can be pressed and pushed to four sides. The marking of the side functions is placed on a non-movable part of the apparatus. Figure 34g shows an alternative where each function has its own switch. Fig. 34h shows a solution where I-IV are pressed towards a centre switch for activation of a function.

In addition, reference will be made to the functionality and the graphic user interface which are described in the Applicant's earlier applications as listed on page 1.

- Fig. 35 shows how a press and tilt switch 430 with five positions I-V can be made, where the elements of these positions are ergonomically shaped so that the user will feel from the shape of the switch where he should press and tilt to activate switch functions.

- Figures 36a-b show an example of the design of an apparatus having the described switch combination. Fig. 36a shows an electronic multifunction apparatus with a keypad for communication and computer functions in addition to a multifunction switch in the form of a rotatable disc switch 432 with five press/tilt functions and a screen. The figure also indicates how the apparatus can be operated using one hand. The thumb of the same hand in which the apparatus is held can freely reach across all the switches. Figure 36b shows an alternative apparatus with rotary roller switch 434.

- All the preceding solutions require a keypad that has marked switches. If the screen area allows, it could be shown on the screen what the individual switches represent. An interactive system of this kind has previously been described by the Applicant in other connections. Figure 37 illustrates an electronic apparatus having a rotatable disc switch with five press and tilt positions and two press and tilt switches 440-440' having five positions, the same as shown, in connection with, e.g., Fig. 33. The apparatus has a

screen 441 that is divided into a first field 442 and a second field 443. Field 442 will show menus and the result of the input of data. Field 443 shows three sub-fields 444-444' and 445. The sub-fields 444-444' show what data switches 440 and 440' represent. The sub-field 445 shows what data switch 438 represents. In a text function, press I on 440 (see Fig. 37a) will give A. On rotation of the disc switch 438 as illustrated in Fig. 37b, new data will appear in field 443 for input by using press/tilt of 438 and 440-440' in the respective positions. Thus, on rotation, the user can step by step fetch all the data which, in a complete keyboard, would have been marked on the keys. This takes place stepwise where three times five data items are shown in field 443. It may be natural to start with the amount of data that is shown in connection with Fig. 33, but here there is a possibility for as much data as the user would like the apparatus to be capable of operating. Figures 38a-b correspond to Figs. 37a-b, but the multifunction switch in this case is a rotary roller switch 448. This switch has press and side tilt positions for activating switch functions. In order to have as many positions as for a rotating disc switch, two press switches 449-449' are added. Figures 39a-b show yet another variant of that shown and explained in connection with Figs. 37 and 38. Here, the multifunction switch is a rotary belt switch 450 with press and four tilt positions for activating switch functions. Figure 40 shows a solution where the multifunction switch 452 has a push function in addition to a press and tilt function which activate switch functions. The push function shifts data in fields for each step in the Y direction. The number of steps is shown as an example and should not be understood as limiting for the invention. The number of steps will depend upon how much data is to be processed by the apparatus. If a screen area allows, all available data could be shown on the screen in all the preceding solutions and selection could be made by rotation or sliding movement of the multifunction switch which moves a cursor 456 over a data item or group of data items that the use wishes to enter. This is shown in Fig. 41.

Apparatus with limited space for a keypad will have to use space on the screen area. Solutions such as those shown in connection with Figs. 37-40 are thus highly suitable for apparatus with little space for a keypad or the need for such. Also, there will not always be space on the keypad for all the functions found on a PC keyboard. Functions related to multifunction apparatus could also exceed the number of switch functions there is space for. This will initiate the need to place a number of data items and functions on the screen when there is no room on the switch, but which could nevertheless be operated using the switches in an interactive system.

Figures 42a-b illustrate an apparatus with a multifunction switch 460, here in the form of a disc switch with five positions for activating switch functions and a screen 462 which is wholly or partially pressure-sensitive. Two extra press switches 463-463' are also shown, but these are not important for the principle. As shown earlier, multifunction switches can be used to navigate a cursor 464 around on a screen area in order to select a data item or a group of data items. Figure 42a shows an icon for write function selected by cursor 464 which, when the switch 460 is pressed, will activate the function. In Fig. 42b, the data items appear on the screen and by navigation of the cursor, the desired group can be selected. This figure shows groups of five data items which can be selected by a press or tilt I-V of switch 460. The system can be used for all the previously shown multifunction switches. If the screen is pressure-sensitive, the user may also choose to press directly on the screen for selection of data items.

Solutions will now be shown where a keypad consisting of switches having five press and/or tilt positions has more than five functions. Fig. 43 shows a keypad 500 consisting of twelve such switches. Each switch represents access to thirteen data items and/or functions. This gives a total of 156 accessible functions without going via a menu. The centre position 505 represents a main function. Fig. 43 shows an example of a multifunction apparatus where number functions are as on a traditional telephone keypad. Other functions and data items are available under the four outer positions 501-504. A multifunction switch 508 (as shown and described in the Applicant's earlier applications) has five press and/or tilt positions I-V, and a rotation function. This switch could be used, *inter alia*, for navigation of a cursor and a screen image indicated by reference numeral 513. Switches 511 and 512 have high-order main functions, but are strictly speaking not necessary as these functions are also found in the keypad in this case. Input of data will now be explained on the basis on Figs. 43b-c. For the sake of simplicity, the figures do not show the whole keypad.

A press on one of the positions I-IV will give us one of the following situations:

1. The data is shown in field 516 and is arranged in sub-fields 516'-516"". Confirmation of the data is effected by a press on the switches 521, 522 or 523, which correspond to sub-fields 516'-516"".
2. The data is shown in field 516 and is arranged in sub-fields 516'-516"". Confirmation of the data is effected by a press on switch 511, multifunction switch V or switch 512, which correspond to sub-fields 516'-516"".

3. The data is shown in field 516 and is arranged in fields 516'-516".
Confirmation of the data is effected by a press on positions I, III or V of the multifunction switches, which correspond to sub-fields 516'-516".
4. The data is shown in field 516 and is arranged in sub-fields 516'-516".
Rotation of the switch 508 moves the cursor 517 and confirmation of the data is effected by a press on position V of the multifunction switch.
5. The data is shown in field 518 and is arranged in sub-fields 518'-518".
Confirmation of the data is effected by a press on positions I, III or V of the multifunction switches, which correspond to sub-fields 518'-518".

Another variant of the invention will now be described in connection with Figs. 43a-b. The figures do not show the whole keypad 500 as shown in Fig. 43a. Fig. 44a shows a variant where a multifunction apparatus contains a multifunction switch 531 with three press and/or tilt positions I-III and a rotation function. Field 532 that is split into sub-fields 532'-532" is found in the screen area 530. Input of data takes place in a manner similar to that described in connection with Fig. 44.

By pressing on one of the positions 501-504", we will obtain one of the following situations:

1. The data is shown in field 532 and is arranged in sub-fields 532'-532".
Confirmation of this data is effected by pressing on the switches 534, 535 or 536, which correspond to sub-fields 532'-532".
2. The data is shown in field 532 and is arranged in sub-fields 532'-532".
Confirmation of the data is effected by pressing on positions I-III of multifunction switch 531, which correspond to sub-fields 532'-532".

Fig. 44b shows a variant where multifunction switch 531 has a press switch arranged axially on either side 538 and 539. This gives us yet another variant:

3. The data is shown in field 532 and is arranged in sub-fields 532'-532".
Confirmation of the data is effected by pressing switches 538, 539 or position I of multifunction switch 531, which correspond to sub-fields 532'-532".

A simplification of the keypad as shown in connection with, e.g., Fig. 44 will now be shown in connection with Fig. 46. The keypad part 540 contains 12 switches having a centre press function 543, and four outer press/tilt positions 543'-543". In the variant shown here, not all the positions 543'-543" have three functions. Only 543" and 543"

contain more than one function. In this case, these positions are assigned to the input of letters and symbols. Input takes place along the lines of that shown in Figs. 43-44.

Positions 543' and 543''' are assigned to main functions and access to menus for functions. In this case, one of the keys 546 is assigned to navigation in a screen image.

- 5 This means that by using the arrow functions, a user can, although with some difficulty, replace the scrolling functions of a rotation switch.

- A reoccurring problem in connection with small keypads in that marking of the keys can be very small and thus difficult to read. As illustrated in Fig. 45c, a switch is shown
10 in the screen image 541. When a desired switch is touched, a sensor will activate the function for showing the switch function on the screen. The sensor may be of a known type per se, for example a capacitive sensor. This may be a function that can be combined with shown functions printed on each switch, or as shown in Fig. 45d where only a main function is marked on each switch and sub-functions only appear on the
15 screen when the switch is touched.

- Fig. 46a illustrates an additional embodiment of that shown in connection with previous solutions for multifunction apparatus with combined keypad and multifunction switch. Keypad 550 has the same number of functions and directly accessible data as shown in
20 connection with Fig. 45. However, navigation is assigned to field 554 which will contain a multifunction switch selected from among variants that are disclosed in the application, or such as that shown in Figs. 46b-d, without this being limiting. The switch must nevertheless contain a navigation function. The switches, like switch 555, which have key numbers 1, 2, 4-6, contain in this example the function for "mode".
25 This means to say that different functions can be installed under these positions, or the user himself can have the option of installing frequently used or popular data under these positions. By way of example, we can consider a function apparatus having telephone function, e-mail function, camera and GPS. A shortcut to camera, for example, is installed under Mode 4. By choosing this mode, the user can immediately
30 use the camera function without having to go via a menu function. The reference numeral 556 indicates a display screen.

- On the basis of Fig. 47, there will follow an explanation of the construction of a press and tilt switch having five positions as shown in connection with Figures 33-47. Switch
35 560 has five positions for activating switch functions. The operating element 561 has a central depression 562 which forms the press position. Four press and tilt positions 562'-562''' are arranged in a cross shape around the centre position. The operating

element 561 has a downward-projecting element part 561' which has a hollow retaining piece 561" which passes through an opening in the frame 564 and is in cooperation with a tilting part 566. The tilting part 566 has a rounded portion at 566' that is movable against a corresponding rounded portion 564' on the frame 564. Four lugs 567-567"" form a cross with the tilting part 566. When the operating element 561 is tilted, respective springs 569'-569"" will be depressed by the lugs for the activation of a switch function with contacts 571'-571"" located on a circuit board 572. The operating element is tilted either by a finger being placed in the concave surface 562 on the operating element, or by raised portion 581'-581"" being pressed. The reference numeral 570 shows an intermediate layer. Pin 565 is in cooperation with the retaining piece 561" of the operating part. When position 562 is pressed, this will cause pin 565 to produce a switch function on the cooperation of spring 569 and contact point 571.

A keypad that is built up of switches as shown in Fig. 47 requires a design that makes the keypad user-friendly. The size is also crucial for user friendliness. Size and user friendliness are critical parameters in the design of modern hand-held apparatus which are to be small, easy to use and are to contain many functions. Switches as shown in Fig. 47 can be placed close together to form a keypad. The switches will not come into conflict with one another as they will be used without the user having to move his finger tip. This is shown in Fig. 48a where the finger 569 is tilted against the concave shape of the switch operating member, illustrated by arrows 568-568"" in this figure. In the event of a press between the switches, a recessed solution as shown in Fig. 49b would prevent activation of two switch functions simultaneously.

Fig. 49 shows a variant of a keypad that consists of 12 switches having five switch functions. Each of the operating elements 590 is in the form of a half wheel. The operating element is "rolled" in each direction for activation of the two switch functions. Tilting activates another two switch functions and a press activates a central function. The movements are represented by the arrows in Fig. 49a. In the majority of concepts for multifunction apparatus, the centre function represents the main function, for example, numbers in an apparatus that has a telephone function as shown in Fig. 49b. The keypad solution here gives the possibility of having a certain space between the keys. The marking of the key functions will have to be done wholly or partially on the intermediate frame. The reference numeral 594 indicates a rounded surface of the operating element. The construction of the switch is the same as that shown in connection with Fig. 47.

A keypad 596 may also consist of only rotary switches, as shown in Figs. 59g-h. Different technical solutions for a switch of this type are disclosed in a number of the Applicant's earlier applications as mentioned in the introduction.

- 5 Switch 591 is rotatable, depressible and tiltable transverse to the direction of rotation as illustrated in Fig. 49g. As it will be difficult to mark a switch like the switch 591, functions must be marked at the side of the switch. This is illustrated in Fig. 49h. If the switch is to contain as many functions and access to data as shown in Figs. 43-46, a marking at the side of the switch will not be practical. This will above all require plenty
- 10 of space, or mean that the print will be extremely small and thus barely readable. Figs. 49e-f illustrate how functions and accessible data for each switch can be placed in a field 593 on a screen. Each of the switches 591 in the keypad gives access to at least as many functions as shown in connection with Fig. 43. The user can activate the function for numbers or another main function by pressing. Rotation will cause three functions
- 15 or data to be shown in field 593. One method for fetching data is to add different functions on directional rotation. For example, access to letters can be assigned to rotation in one direction. On rotation through one step, for example as indicated by 597, three letters will appear in fields, see Fig. 49e. Selection of data is then carried out by a tilt or a press I-III as indicated in Fig. 49g. The fields 593'-593'' correspond to
- 20 press and tilt positions I-III. Additional stepwise rotation will result in the screen showing, for example, small letters and additional symbols. Movement of the switch in direction 597' will give access to additional functions as shown in the field 593, Fig. 49f.
- 25 With the illustrated solutions, it will be easy for a skilled person to combine solutions that are suitable for small or large screens, few or many switches. Known solutions from, for example, mobile telephones with a partly concealed keypad (under a cover or pull-out) and solutions with partly concealed screen can easily adopt solutions as disclosed in this application. It will also be known to a person skilled in the art that
- 30 parts of a keypad can be concealed and brought out when needed. Here, there are known, *inter alia*, mobile phones with a folding solution, a sliding keypad or a sliding or hinged cover which wholly or partly conceals the keypad and operating means of the apparatus.
- 35 A variant of this is shown in Fig. 50 which shows an apparatus that has a multifunction switch 600 that is accessible at all times. In addition, the apparatus has a keypad 601 as shown in Fig. 43 and a simple, standard keypad 602 known from today's telephones.

The user can switch between these keypads by pushing a screen over the keypad that he does not wish to use, illustrated by 604-604'. As shown in Fig. 50c, the contents of the screen will become oriented according to the keypad that is to be used. The multifunction switch 600 will also become oriented accordingly. Figs. 50d-e show a variant where the multifunction switch is physically on the same part 608 as the screen. Rotation of the part 608 is done around the centre of switch 600.

Fig. 51 shows how a rotary disc switch can be constructed in a manner different from the solutions disclosed in the Applicant's earlier applications. The solution uses magnetism both for the stepwise rotational movement and for the press and tilt functions. Figs. 51a-b show the different parts of the switch. The operating element 610 contains a magnet 612 in the form of a ring. This magnet will have a certain number of poles. In this connection 4-32 poles would be appropriate. The magnet will operate against four other magnets 613-613''' that are mounted in a frame 615. If magnet 612 has 16 poles, this will give eight steps for rotation of the operating element 610. Another four magnets 616 are mounted in the frame. These keep the arms 619-619''' in cross 618 from touching contacts fields 621-621'''. The cross has a projection 618' which passes through a hole in the frame 615. A pin 614 passes from the centre of the operating element and through the cross. A metal ring 623 is fastened to the pin. The ring keeps the pin from touching contact field 622. A tilt of the operating element will turn the cross 618 so that arms 619-619''' release the magnet and touch contact points 621-621'''. In this way both a tactile feeling and a switch function are obtained. A press directly in the centre of the switch gives a switch function at 622. The tactile feeling is obtained in that the ring 623 releases the cruciform part that is magnetised. Rotation of the operating element is detected by Hall sensors 625 which are located on the frame. The sensor measures alternation in the magnetic field that is generated by magnet 612. The sensor may also be located on the circuit board 620 as indicated by reference numeral 626. Contacting on press and tilt function is effected using prior art which opens contact fields or film contacts as indicated by reference numeral 628. Fig. 51e shows variant for detection of rotation. Here, a spring member 630 will be drawn towards the operating element containing the magnet 612 and thus activate a switch function as shown at 632. The polarity in the magnet will on rotation alternately attract and repel the spring member. The operating element can in another variant contain a plurality of smaller magnets spaced apart in a ring.

The technology for the use of magnets for the press and tilt function would also be appropriate for switches which have no function for rotation. The skilled person will

appreciate that the solutions shown in connection with Fig. 47 and Fig. 51 are interchangeable.

Anyone of ordinary skill in the art will see that all the illustrated solutions and systems
5 can be used in all forms of electronic equipment, preferably connected to display functions.

P a t e n t c l a i m s

1.

An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen, and apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and transport and electronic equipment associated therewith, wherein the operating device is centrally depressible and sideways tiltable, and wherein its user-contact portion consists of a one-piece surface for both tilting and depression, characterised in

- that a central pin secured under the user-contact portion of the operating device is slidable through a tilting part for depressing a central spring and activating a contact point;
- that the central pin will move the tilting part to depress a spring and activate a contact point when the user-contact portion of the operating device is tilted; and
- that the contact points and/or springs for the operating device are arranged in a row and are mutually sized and spaced apart at a distance that is smaller than an adult finger tip, whereby it is made difficult for an adult finger to actuate just one of these. (Fig. 7)

2.

An operating device as disclosed in claim 1, characterised in

- that vertical depression of the operating device is designed to activate a central switch function, i.e., without actuating the lateral contact points; and
- that tilting the operating element activates lateral switch functions, i.e., without actuating the central switch point.

3.

An operating device as disclosed in claim 1 or 2, characterised in

- that a central pin is tiltable and depressible about a through-going shaft and the tilting part is rotatable about the same shaft. (Fig. 8).

4.

An operating device as disclosed in claim 1 or 2, characterised in

- that a central pin is tiltable and depressible about a through-going shaft and the tilting part is rotatable about the same shaft, but activates the opposite switch function when tilted to one side. (Fig. 7j)

5.

An operating device as disclosed in claim 3, characterised in

- that several operating devices are secured to the same through-going shaft in a common frame. (Fig. 8d)

6.

An operating device as disclosed in claim 5, characterised in

- that springs and contact points are located in the same plane and in the same row.

7.

An operating device as disclosed in one or more of claims 1, 2, 3, 5 or 6, characterised in

- that lateral springs and contact points are arranged vertically relative to a central spring and contact point. (Figs. 7h-i)

8.

An operating device as disclosed in claim 1 or 2, characterised in

- that the user-contact portion has hook-shaped engagement parts that are in engagement with corresponding engagement details on the tilting part, wherein when non-actuated and when the operating device is tilted, both parts will be in engagement with each other, but where depression of the user-contact portion will release the parts. (Fig. 11)

9.

An operating device as disclosed in one or more of claims 1, 2 and 8, characterised in

- that when the centre of the user-contact portion is pressed, a central switch function will be activated; and
- that when the user-contact portion is tilted, a switch function on the opposite side will be activated.

10.

An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen, and apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and

transport and electronic equipment associated therewith, wherein the operating device is centrally depressible and sideways tiltable, and wherein its user-contact portion consists of a one-piece surface for both tilting and depression, characterised in

- that the user-contact portion is movable with resistance caused by a spring located on a bridge through the switch part;
- that the user-contact portion is depressible and tiltable about two through-going shafts; and
- that the underside of the user-contact portion has four pins for actuating switch functions. (Fig. 9).

11.

An operating device as disclosed in claim 10, characterised in

- that two of the pins of the user-contact portion, when actuated by a press or tilt, will activate pairs of contact points so as to give a switch function.

12.

An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen, and apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and transport and electronic equipment associated therewith, wherein the operating device is centrally depressible and sideways tiltable, and wherein its user-contact portion consists of a one-piece surface for both tilting and depression, characterised in

- that the operating device is secured centrally on its underside to a circular spring which allows deformation on pressing and tilting; and
- that the underside of the operating element has three pins so arranged that when the user-contact portion is pressed in its centre, an underlying contact is activated, and when the user-contact portion is tilted lateral contacts are activated. (Fig. 10)

13.

An operating device as disclosed in claim 12, characterised in

- that springs and contact points are arranged in a triangle in the same plane. (Figs. 7l-n)

14.

An operating device as disclosed in one or more of claims 1-13,

characterised in

- that the user-contact portion of the switch has a contact face selected from the group consisting of the following shapes:

- centrally concave;
- 5 - centrally concave with lateral smaller concave portions;
- centrally convex;
- centrally convex with smaller convex portions on each side;
- centrally downward curved;
- centrally downward curved with smaller curved portions on each side;
- 10 - centrally upward curved;
- centrally upward curved with smaller upward curved portions on each side;
- three adjacent upward-projecting squares with distinct spaces therebetween;
- three adjacent upward-projecting circles with distinct spaces therebetween;
- three adjacent upward-projecting ovals with distinct spaces therebetween;
- 15 - three adjacent oval depressions;
- three adjacent round depressions;
- flat;
- flat central portion with upward projecting faces at each side;
- flat central portion with downward projecting faces at each side; and
- 20 - three adjacent keel-shaped raised portions in a row. (Fig. 12)

15.

An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen, and apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and transport and electronic equipment associated therewith, wherein the operating device consists of a stepwise rotatable disc that is centrally depressible and tiltable in four sideways directions, and wherein its user-contact portion consists of a one-piece surface for both tilting and depression,

30 characterised in

- that the user-contact portion is made of a transparent, light-conducting material; and
- that the user-contact portion is surrounded by a ring made of a transparent, light-conducting material. (Fig. 15)

35

16.

An operating device as disclosed in claim 15, characterised in

- that a light-blocking material covers parts of the user-contact portion which it is not desirable to illuminate; and
- that the centre of the user-contact portion will be visible when light is applied from the side.

5

17.

An operating device as disclosed in claim 16, characterised in

- the ring part is supplied with light from a light source from the side; and
- that the ring part has light-blocking fields for marking the tilting direction.

10

18.

An operating device as disclosed in claim 15, characterised in

- that a light source is placed under the operating device to illuminate and mark the centre of the user-contact portion; and
- 15 - that a light source is placed under the ring part to illuminate and mark the tilt positions of the user-contact portion.

19.

20 An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen, and apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and transport and electronic equipment associated therewith, wherein the operating device consists of a stepwise rotatable roller that is centrally depressible and sideways tiltable, characterised in

- 25 - that the user-contact portion in the form of said roller is made of a transparent, light-conducting material; and
- that at the end portions of the user-contact portion there are rings made of a transparent, light-conducting material. (Fig. 16)

30 20.

An operating device as disclosed in claim 19, characterised in

- that a light-blocking material covers parts of the user-contact portion that it is not desirable to illuminate; and
- that parts of the user-contact portion for marking press and tilt positions will be visible when light is applied.

35

21.

An operating device as disclosed in claim 20, characterised in

- that the ring part is supplied with light from a light source from the side.

5 22.

An operating device as disclosed in claim 19, characterised in

- that the ring part is supplied with light from a light source from the underside.

23.

10 An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen, and apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and transport and electronic equipment associated therewith, wherein the operating device is centrally depressible and tiltable sideways in four directions, and wherein its user-
15 contact portion consists of a one-piece surface for both tilting and depression, characterised in

- that a cruciform tilting part has a through-going pin for activation of a central switch function when the user-contact portion is pressed; and
- that the tilting part activates one of four switch functions when the user-contact
20 portion is tilted or actuated sideways. (Fig. 17)

24.

An operating device as disclosed in claim 23, characterised in

- that springs and contacts are located in the same plane.

25

25.

An operating device as disclosed in claim 23, characterised in

- that four adjacent springs and contact points are arranged vertically relative to a central spring and contact point.

30

26.

A hand-held electronic apparatus with or without a screen, or apparatus that are remote-connected to a screen or display means, wherein a switch combination or keypad can be manipulated by at least one finger from the same hand of a user as that holding or
35 supporting the apparatus, characterised in

- that the switch combination consists of at least four switches, each being centrally depressible and sideways tiltable and which are able to activate user

- functions corresponding to known twelve-key numeric keypads;
- that each switch is marked with at least three functions and/or possible entered data; and
 - that the switches together form a central "ditch" or "backbone" that can be felt by the user's finger. (Figs. 13-14)

27.

An apparatus as disclosed in claim 26, characterised in

- that each individual switch may be so shaped that, seen from the front of the apparatus, gives the impression of a plurality of switch parts and/or in order to show a plurality of switch functions. (Fig. 18)

28.

An apparatus as disclosed in claim 26, characterised in

- that each individual switch has a different shape seen from the front of the apparatus so that together they form a common uniform shape. (Fig. 18)

29.

An apparatus as disclosed in claim 26, characterised in

- that the switch combination contains a switch, control element or operating device that is related to screen navigation and/or for use in the input of data, the operating device being selected from the group:
 - a rotatable disc that is centrally depressible and tiltable in at least four directions;
 - a rotatable roller that is centrally depressible and tiltable in two directions;
 - a rotatable belt that is centrally depressible and tiltable in two, three or four directions;
 - a stepwise slidable button that is centrally depressible and tiltable in two directions;
 - a stepwise slidable button that is centrally depressible and tiltable in four directions; and
 - a button that is centrally depressible and tiltable in four directions. (Fig. 20)

30.

An apparatus as disclosed in claim 29, characterised in

- that the switch combination contains two independent keys for functions belonging to the group:

- o Yes
- o Accept
- o No
- o Back
- o On
- o Off.

10 31.

An apparatus as disclosed in claim 30, characterised in

- that the switch combination contains a switch, control element or operating device that is related to screen navigation and/or for input of data, the operating device being selected from the group:
 - 15 - a rotatable disc switch with three independent press switches;
 - a rotatable disc switch with press function and two, three or four independent press switches;
 - a rotatable disc switch with four tilt positions having alternatively two, three or four independent press switches;
 - 20 - a rotatable disc switch that is centrally depressible and has four tilt positions, and two independent press switches;
 - a rotatable roller switch with three independent press switches;
 - a rotatable roller switch with a press function and two, three or four independent press switches;
 - 25 - a rotatable roller switch with two tilt functions and two, three or four independent press switches;
 - a rotatable roller switch that is centrally depressible with two tilt functions, and two, three or four independent press switches;
 - a rotatable belt switch with three independent press switches;
 - 30 - a rotatable belt switch that is centrally depressible with two independent press switches;
 - a rotatable belt switch that is tiltable in two directions, with two independent press switches;
 - a rotatable belt switch that is tiltable in four directions;
 - 35 - a rotatable belt switch that is centrally depressible with four tilt positions, and two independent press switches. (Fig. 19)

32.

A hand-held electronic apparatus with or without a screen, or apparatus that are remote-connected to a screen or display means, wherein a switch combination or keypad can be manipulated by at least one finger from the same hand as that holding or supporting the apparatus, characterised in

- that the switch combination consists of at least two operating elements, of which one is centrally depressible and sideways tiltable and the other has a function for screen navigation and/or is suitable for the input of data, the operating elements being selected from the group:
 - a rotatable disc that is centrally depressible and tiltable in at least four directions;
 - a rotatable roller that is centrally depressible and tiltable in two directions;
 - a rotatable belt that is centrally depressible and tiltable in two, three or four directions;
 - a stepwise slidable button that is centrally depressible and tiltable in two directions;
 - a stepwise slidable button that is centrally depressible and tiltable in four directions; and
 - a button that is centrally depressible and tiltable in four directions.
- (Fig. 22)

33.

A hand-held electronic apparatus as disclosed in the preamble of claim 32, characterised in that

- the switch combination consists of at least four switches shaped as upward projecting studs, each of which are centrally depressible and sideways tiltable, and an operating device that is related to screen navigation and/or is useful for the input of data, and where the operating device is in the form of an upright stud that is centrally depressible and tiltable in four directions. (Fig. 23)

34.

A hand-held electronic apparatus as disclosed in claim 33, characterised in

- that each switch has at least three switch functions, where the marking thereof is preferably located on an apparatus housing in the immediate vicinity of the switch.

35.

A hand-held electronic apparatus as disclosed in the preamble of claim 32, characterised in

- that the switch combination consists of operating elements, wherein one is a button that is centrally depressible and tiltable in four directions, wherein the other has a function for screen navigation and/or can be used for the input of data, and where these elements are selected from the group:
 - a rotatable disc which alternatively is centrally depressible and tiltable in up to four directions;
 - a rotatable roller which alternatively is centrally depressible and tiltable in two directions; and
 - a rotatable ring which alternatively is tiltable in two, three or four directions. (Fig. 22)

15 36.

A hand-held electronic apparatus with or without a screen, or apparatus that are remote-connected to a screen or display means, wherein a switch combination or keypad can be manipulated by at least one finger from the same hand of a user as that holding or supporting the apparatus, characterised in

- that the switch combination consists of four switches, each of which is centrally depressible and sideways tiltable and capable of activating user functions. (Fig. 28)

37.

25 A hand-held electronic apparatus as disclosed in claim 36, characterised in

- that functions will be indicated on a screen according to the pattern the switch positions have, wherein the indications change in order to adapt to the user functions of the apparatus. (Fig. 29)

30 38a.

A hand-held electronic apparatus with or without a screen, or apparatus that are remote-connected to a screen or display means, wherein a switch combination or keypad can be manipulated by at least one finger from the same hand as that holding or supporting the apparatus, characterised in

- that the switch combination consists of four switches, each of which is centrally depressible and sideways tiltable and which are able to activate user functions corresponding to a known 12-key numeric keypad.

38b.

A hand-held electronic apparatus as disclosed in claims 26-31, characterised in

- that the apparatus contains a transmitter and a receiver for radio communication, infrared communication, satellite communication, a microprocessor, memory and storage media and a computer program for controlling the apparatus contents by display on a screen or by remote-control control external functions from the group:

- o Telephone.
- o TV
- o GPS
- o Radio
- o PC functions
- o Internet
- o Dwelling functions
- o Car and conveyance functions.

39.

A hand-held electronic apparatus as disclosed in claim 24, 27 or 28, characterised in

- that the apparatus has an input for upgrading and installing new functions and remote control of accessory equipment.

40.

A system of switches for the input of data and the control of user functions in hand-held electronic apparatus with or without a screen and apparatus that are remote-connected to a screen or display means, and for controlling functions in means of conveyance and transport and electronic equipment associated therewith, characterised in

- that the system is composed of at least four switches, each of which is centrally depressible and sideways tiltable and which are able to activate user functions corresponding to a known 12-key keypad;
- that each switch is marked with at least three functions and/or possible input of data; and
- that the switches together form a central "ditch" or "backbone" that can be felt by a user's finger.

41.

A system of switches as disclosed in claim 40, characterised in

- that the switch combination contains a switch, control element or operating device that is primarily related to screen navigation, but which can also be used in the input of data, the operating device being selected from the group:
 - o a rotatable disc, centrally depressible and tiltable in at least four directions;
 - o a rotatable roller, centrally depressible and tiltable in two directions;
 - o a rotatable belt, centrally depressible and tiltable in two, three or four directions;
 - o a stepwise slidable button, centrally depressible and tiltable in two directions;
 - o a stepwise slidable button, centrally depressible and tiltable in four directions; and
 - o a button, centrally depressible and tiltable in four directions.

42.

A system as disclosed in claim 40, characterised in

- that the switch combination contains two independent keys for functions belonging to the group:
 - o Yes
 - o Accept
 - o No
 - o Back
 - o On
 - o Off.

43.

A system as disclosed in claim 40, characterised in

- that the switch combination contains a switch, control element or operating device that is related to screen navigation and/or for the input of data, the operating device being selected from the group:
 - a rotatable disc switch with three independent press switches;
 - a rotatable disc switch with press function and two, three or four independent press switches;
 - a rotatable disc switch with four tilt positions and with independent press switches;

- a rotatable disc switch that is centrally depressible and has four tilt positions, and two independent press switches;
- a rotatable roller switch with three independent press switches;
- a rotatable roller switch with a press function and two, three or four independent press switches;
- a rotatable roller switch with two tilt functions and two, three or four independent press switches;
- a rotatable roller switch that is centrally depressible with two tilt functions, and two, three or four independent press switches;
- a rotatable belt switch with three independent press switches;
- a rotatable belt switch that is centrally depressible with three independent press switches;
- a rotatable belt switch that is tiltable in two directions, and two independent press switches;
- a rotatable belt switch that is tiltable in four directions;
- a rotatable belt switch that is centrally depressible with four tilt positions, and two independent press switches.

44.

20 An interactive system associated with electronic equipment having a screen or display means, which includes switches for activating typical input functions known from a 12-key keypad, a plurality of press switches and a multifunction switch for carrying out apparatus functions, characterised in

- that input of functions is effected by using a plurality of four switches which have press function and two-way tilt; and
- that navigation, movement of a cursor on a display screen and confirmation of desired function are effected using a multifunction switch of this kind. (Figs. 20-21)

45.

30 An interactive system as disclosed in claim 44, characterised in

- that the multifunction switch is selected from the group:
 - a rotatable disc that is centrally depressible and tiltable in at least four directions;
 - a rotatable roller, centrally depressible and tiltable in two directions;
 - a rotatable belt, centrally depressible and tiltable in two, three or four directions;

45

- a stepwise slidable button that is centrally depressible and tiltable in two directions;
- a stepwise slidable button that is centrally depressible and tiltable in four directions; and
- 5 - a button that is centrally depressible and tiltable in four directions.
(Fig. 22)

46.

An interactive system as disclosed in claim 44 or 45, characterised in

- 10 - that it includes two independent keys for functions belonging to the group:
 - o Yes
 - o Accept
 - o No
 - o Back
 - 15 o On
 - o Off.
- (Figs. 21, 24)

47.

- 20 An interactive system as disclosed in one or more of claims 44-46, characterised in

- that the input of text functions together with a word list for predictive assistance, wherein a field at all times shows the number of alternative hits for whole words.

25 48.

An interactive system as disclosed in one or more of claims 44-47, characterised in

- that the input of a letter that is the same as that which comes first among the predictively resulting letters will result in the letter being kept, but the rest of the
30 word will change to the next word in the word list.

49.

An interactive system as disclosed in one or more of claims 44-48, characterised in

- 35 - that a press on a key with at least three options is designed to give the letter that is possible on the basis of the word list.

50.

An interactive system as disclosed in one or more of claims 44-46, characterised in

- that the screen is designed to show a first vertical menu, wherein each individual function will show a second adjacent sub-menu when a cursor is moved vertically by rotating the switch;
- that the sub-menu is designed to be confirmed either by a press on the rotary switch, or by OK on the press switch, further rotation of the switch moving the cursor over the sub-menu in the vertical direction; and
- that on confirmation of a function in a sub-menu, the result, task or field for input of data or navigation will appear, or apparatus functions will be activated. (Fig. 21)

51.

An interactive system associated with electronic equipment having a screen or display means, which includes a switch having three functions and a multifunction switch for carrying out apparatus functions. characterised in

- that input of functions is effected by using at least one press and two-way tiltable switch; and
- that navigation and movement of a cursor on the display screen is effected using a multifunction switch of this kind.

52.

An interactive system as disclosed in the preamble of claim 51, characterised in

- that confirmation of a desired function is effected by using a multifunction switch of this kind. (Fig. 22)

53.

An interactive system associated with electronic equipment having a screen or display means, which includes press and four-way tiltable switches, and a multifunction switch for carrying out apparatus functions, characterised in

- that the multifunction switch is from the group: rotating ring, rotating disc, rotating wheel and rotating roller. (Fig. 22)

54.

An interactive system associated with electronic equipment having a screen or display means, which includes a four-way tilt and press switch, and switches for activating typical input functions known from a 12-key keypad for carrying out apparatus

5 functions, characterised in

- that input of functions is effected by using four press and two-way tiltable switches; and
 - that navigation, movement of a cursor on the display screen, confirmation of desired function, and closing of functions are effected using such a press and
- 10 four-way tilt switch

55.

An interactive system associated with electronic equipment having a screen or display means, which includes a rotatable two-way tilt switch and additional switches for

15 carrying out apparatus functions, characterised in

- that two independent keys are included for functions belonging to the group:
 - o Yes
 - o Confirm
 - o No
 - o Back
 - o On
 - o Off.

(Figs. 25-26)

25 56.

An interactive system as disclosed in claim 55, characterised in

- that the screen consists of a first field for information, a second field for result, and a third field for menus and data for input;
 - where numbers, letters, symbols and functions are divided into two columns in
- 30 order on rotation to perform vertical marking with a cursor and activation by tilting the rotary switch.

57.

An interactive system as disclosed in claim 55, characterised in

- 35 - that letters, numbers and symbols are arranged in groups of two in each column, where a first tilt shows the selected pair and a second tilt chooses between them.

58.

An interactive system as disclosed in claim 55, characterised in

- that letters, numbers and symbols are arranged in groups of three in each column, where a first tilt in the desired step and direction marks and selects data at the top of the row, but which will shift to second and third data if, without any time delay, a tilt to the same side is carried out a second or third time.

59.

An interactive system as disclosed in claim 55, characterised in

- that letters, numbers and symbols are arranged in two groups of three, are arranged to be shown line by line in a separate field and are brought forth by rotation of the switch.

60.

An interactive system associated with electronic equipment having a screen or display means, which includes a rotatable press and tilt switch which when activated by a user controls the input of data and/or navigation and movement of a cursor on the display screen for carrying out apparatus functions, characterised in

- that movement in the screen image in the x, y or z direction is effected by rotation of the switch, wherein a shift between the directions is made respectively at the right, centre and left position on the same switch. (Fig. 27)

61.

An interactive system as disclosed in the preamble of claim 60, characterised in

- that movement in the screen image in the x and y direction is effected by an end press or side tilt of the switch, and that z (zoom) is done by rotation thereof.

62.

An interactive system associated with electronic equipment having a screen or display means, which includes a keypad of switches without silk screen print for carrying out apparatus functions; characterised in

- that the keypad consists of 3 x 4 switches having a total of 12 possible functions and which is interactive with the screen or display means;
- that each switch has press and sideways tilt functions; and
- that the screen image at all times shows the function of each switch position.

63.

An interactive system as disclosed in one or more of claims 44-55 and 60-62, characterised in

- that the apparatus contains a menu of symbols and icons that are selectable through switch functions where symbols and icons represent functions from the group:
 - o Telephone
 - o TV
 - o GPS
 - o Remote control through IR, radio, bluetooth
 - o Radio
 - o PC functions
 - o Dwelling functions
 - o Car and conveyance functions.

64.

An interactive system as disclosed in one or more of claims 44-55 and 60-63, characterised in

- that the system allows a change of menu and the addition of icons and functions.

65.

A combination of operating devices for the input of data and control of switch functions in hand-held electronic apparatus with or without a screen, and/or apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and transport and electronic equipment associated therewith, wherein all operating devices are centrally depressible and sideways tiltable to two, three or four sides, characterised in

- that each operating device can activate at least one and at most five switch functions; and
- that the operating devices are marked with the functions they represent.

66.

A combination of operating devices as disclosed in claim 65, characterised in

- that a combination of twelve operating devices is designed, together with a multifunction switch with rotation and/or sliding function, directly and with graphic guidance, to control functions that are standard for a computer; and

- that by displaying the function of the switches on the screen, additional functions will be accessible.

67.

- 5 A combination of operating devices as disclosed in claim 65 or 66, characterised in

- that these operating devices are operable by using a finger that is on the same hand as that holding the apparatus of which the operating devices are a part.

10 68.

A combination of operating devices as disclosed in claim 65, 66 or 67, characterised in

- that the circumferential shape of the operating devices is from the group: round, oval, square, rectangular, diamond-shaped, triangular and star-shaped.

15

69.

A combination of operating devices as disclosed in claims 65, 66 or 67, characterised in

- that the user-contact portion of the operating device consists of a one-piece surface for both tilting and depression; and
- 20 - that the operating devices have a contact face formed of projections or depressions that indicate the press and tilt positions of the operating devices.

70.

- 25 Hand-held electronic apparatus or equipment with a screen and/or apparatus that are remote-connected to a screen or display means, and equipment for control functions in means of conveyance and transport and electronic equipment associated therewith, containing a combination of operating devices for the input of data and control of user functions, wherein all the operating devices are centrally depressible and sideways
- 30 tiltable to two, three or four sides, characterised in

- that each operating device can activate at least one and at most five switch functions; and
- that at least one operating device has a rotation or sliding function for navigation and manipulation of data on a screen.

35

71.

Equipment as disclosed in claim 70, characterised in

- that in a particular mode or program for operation of the equipment only certain functions contained in the operating devices will be active and will be activated on manipulation.

5 72.

Equipment as disclosed in claim 70 or 71, characterised in

- that only three operating devices for operating the equipment are present;
 - that the functions for each operating device are shown on the screen; and
 - that these functions can be changed by rotation or a sliding movement of one of
- 10 the operating devices, a so-called multifunction switch.

73.

Equipment as disclosed in claim 70, 71 or 72, characterised in

- that the multifunction switch is from the group:

- 15 - a rotatable disc that is centrally depressible and tiltable in at least four directions;
 - a rotatable roller that is centrally depressible and tiltable in two directions;
 - a rotatable belt that is centrally depressible and tiltable in two, three or
 - 20 four directions;
 - a stepwise slidable button that is centrally depressible and tiltable in two directions;
 - a stepwise slidable button that is centrally depressible and tiltable in four
- 25 directions.

74.

Equipment as disclosed in claim 70, characterised in

- that contents of displays on a touch screen are designed to eliminate the need for operating devices, as their functions are moved to the screen.

75.

Equipment as disclosed in one or more of claims 70-74, characterised in

- that equipment with a multifunction switch may optionally be used instead of other operating element.

35

76.

A predictive system for the input of data in hand-held electronic apparatus with or without a screen and/or apparatus that are remote-connected to a screen or display means, and for control functions in means of conveyance and transport and electronic equipment associated therewith, wherein the operating devices are centrally depressible and tiltable sideways to two, three or four sides, and where a press at one of the positions of the operating device is designed to give a result from a stored list of most frequently used data expressions on the basis of a selected data item, characterised in

- that a press on the positions of the operating device will activate the system to select a data expression that occurs most frequently on the basis of all the data items that the operating device represents;
- that after a first data item has been selected, but the proposed data expression has been rejected, manipulation of the position on the operating device will confirm the required data item; and
- that on further manipulation of the operating device the system will again propose a data expression on the basis of the preceding data item and the system's list of ranked data.

77.

A hand-held electronic apparatus with a screen and apparatus remote-connected to a screen or display means, wherein a combination of operating devices can be manipulated by at least one finger from the same hand as that holding or supporting the apparatus, wherein all the operating devices are centrally depressible and sideways tiltable to two, three or four sides, characterised in

- that the operating devices activate three, four or five switch functions; and
- that twelve operating devices with the addition of a multifunction switch activate known computer functions when manipulated.

78.

A hand-held electronic apparatus as disclosed in claim 77, characterised in

- that the operating devices replace the ordinary alphanumeric keyboard for a computer.

79.

A piece of electronic equipment, e.g., electronic apparatus with or without connection to a display screen, including electronic equipment such as mobile telephones, remote controls, mini-PC equipment, electronic equipment related to control functions in means

of conveyance and transport, or an electronic device for use in such means of conveyance or transport, wherein the piece of equipment has a combination of several operating devices for the input of data and control of user functions, characterised in

- 5 - that each operating device has an operating element which by using a finger can be depressed in the centre and moved, for example tilted, in four directions for activating separate switch functions, the operating element having a connection to a central pin for activating a centre switch, wherein the pin passes through a cruciform tilting part that has lugs for activating four switch functions:
- 10 - that at least one of the switch functions of an operating device is designed, when activated, to activate or display additional options among two or three sub-functions or data items; and
- that the piece of equipment also has a multifunction switch device designed to select one sub-function or one data item among the presented options.

15

80.

A piece of equipment as disclosed in claim 79, characterised in

- that the multifunction switch device is selected from the group consisting of:
 - 20 - a rotatable disc that is centrally depressible and tiltable in at least four directions;
 - a rotatable roller that is centrally depressible and tiltable in two directions;
 - a rotatable belt that is centrally depressible and tiltable in two, three or four directions;
 - 25 - a stepwise slidable button that is centrally depressible and tiltable in two directions;
 - a stepwise slidable button that is centrally depressible and tiltable in four directions.

30 81.

A piece of electronic equipment, e.g., electronic apparatus with or without connection to a display screen, including electronic equipment such as mobile telephones, remote controls, mini-PC equipment, electronic equipment related to control functions in means of conveyance and transport, or an electronic device for use in such means of

35 conveyance or transport, wherein the piece of equipment has a combination of several operating devices for the input of data and control of user functions, characterised in

- that each operating device has an operating element which by using a finger can be depressed in the centre, tilted and rotated for fetching successive options from among sub-functions and/or data items; and
- either that the operating device, on depression of the operating element in a position for selected data item, activates the selection of the data item;
- or that the piece of equipment has a separate switch device, for example, a multifunction switch device, designed to activate selection of a sub-function or a data item from among the presented options.

10 82.

A piece of equipment as disclosed in claim 79, 80 or 81, characterised in

- that four of the switch functions of the operating devices will activate another three options among sub-functions or data items.

15 83.

A piece of equipment as disclosed in claim 79, 80, 81 or 82, characterised in

- that the piece of equipment is equipped with an array of twelve operating devices.

20 84.

A piece of equipment as disclosed in claim 79, 80, 81, 82 or 83, characterised in

- that the piece of equipment contains in addition a combination of twelve keys having one switch function each.

25 85.

A piece of equipment as disclosed in one or more of claims 79-84, wherein the piece of equipment comprises a display screen, characterised in

- that the display screen is slidable or rotatable in relation to said plurality of operating devices and/or keys.

30

86.

A piece of equipment as disclosed in claim 85, characterised in that the display screen is arranged, in a position of use for the piece of equipment, to cover either said plurality of operating devices or said plurality of keys.

35

87.

A piece of equipment as disclosed in one or more of preceding claims 79-86,

characterised in

- that the separate switch device of the piece of equipment is operatively accessible at all times in the use modes of the piece of equipment.

5 88.

A piece of equipment as disclosed in one or more of preceding claims 79-87, characterised in

- that the screen contents shown on the display screen are designed to become oriented as a function of the one of the two keypads having respectively
10 operating devices and one-switch keys that is closest to the user of the piece of equipment.

89.

15 A piece of equipment as disclosed in one or more of preceding claims 79-88, characterised in

- that the functions belonging to said separate switch device are arranged to become oriented in relation to the available keypad of either operating devices or one-switch keys, and the position of the display screen.

20 90.

A piece of equipment as disclosed in one or more of claims 79-89, characterised in

- that said separate switch device is mounted on a movable support for the display screen and is designed to move together therewith on a turning or sliding movement of the support relative to the operating device or one-switch key
25 constructed keyboards of the piece of equipment.

91.

A piece of equipment as disclosed in one or more of preceding claims 79-90, characterised in

- 30 - that the piece of equipment has a predictive means for proposing data expressions from a list;
- that on the input, via a selected operating device in the keypad, of a second data item, after the first data item has been selected via the chosen or a previously chosen operating device in the keypad and confirmed, the means is
35 designed to suggest a data expression on the basis of all available data items as the last chosen operating device in the keypad.

92.

A piece of equipment as disclosed in claim 91, characterised in

- that on further manipulation of the chosen operating device or another operating device in the keypad, the means will again advance suggestions of a new data expression on the basis of the preceding data item and the mean's list of ranked data and on the basis of the position last touched on the chosen operating means.

93.

A piece of equipment as disclosed in claims 91-92, characterised in

- that on the input of a data item which according to a stored list of data expressions, does not form a known data expression, said predictive means is designed to advance suggestions of a new data expression on the basis of the data items that are available on the same operating device; and
- that on the input of a second data item after confirmation of a first data item, which then together according to a stored list of data expressions, do not form a known data expression, the predictive means is designed to advance suggestions of a new data expression on the basis of the first data item and the data items that are available on the same operating device as the second inputted data item.

94.

A piece of equipment as disclosed in one or more of the preceding claims, wherein the keypad of the piece of equipment is interactive with a display screen that is designed to display options, e.g., in a menu, alphabet, set of characters, which at least in part has an activation matrix having three columns related to the X direction (X1, X2, X3) and/or a combination of fields that reflect the positions and functions of the multifunction switch on the piece of equipment, characterised in

- that where a switch position on the operating device is associated with three sub-functions and/or data items, the piece of equipment is designed on activation of related switch function to arrange the sub-functions and/or the data items in three fields on the screen, and where a further selection and confirmation of desired sub-function and/or data item is effected by a press in the correct X position on the piece of equipment's corresponding part of a separate switch device, or on one of the operating devices which has the same X position as the X position of the desired sub-function and/or data item on the screen.

95.

A piece of electronic equipment, e.g., electronic apparatus with or without connection to a display screen, including electronic equipment such as mobile telephones, remote controls, mini-PC equipment, electronic equipment related to control functions in means of conveyance and transport, or an electronic device for use in such means of conveyance or transport, wherein the piece of equipment has a keypad consisting of a plurality of one-switch keys for the input of data and/or control of user functions, wherein the display screen in interactive cooperation with the keypad effects the display thereon of options, e.g., in a menu, alphabet, set of characters, which at least partly has an activation matrix having three columns related to the X direction (X1, X2, X3) and/or a combination of fields that reflect the positions and functions of the keys on the piece of equipment, characterised in

- that where a switch position on the operating device is associated with three sub-functions and/or data item, the device is designed on the activation of related switch function to arrange the sub-functions and/or data items in three field on the screen, and where a further selection and confirmation of desired sub-function and/or data item is effected by a press on the correct X position on the piece of equipment's corresponding part of a separate switch device, or on one of the keys that has the same X position as the X position of the desired sub-function and/or data item on the screen.

96.

A piece of equipment as disclosed in one or more of preceding claims 79-94, characterised in

- that the keypad is so designed that when the operating device is touched, its configuration of accessible data will be shown on the display screen.

97.

A piece of equipment as disclosed in claim 95, characterised in

- that the keypad is so designed that when a key is touched, its configuration of accessible data will be shown on the display screen.

98.

A piece of equipment as disclosed in one or more of claims 79-94 and 96, characterised in

- that the operating devices each have a stepwise rotatable, depressible and tiltable operating element, where at the rotational steps of the operating element, the accessible data of the operating device is shown on the display screen.

5 99.

A piece of equipment as disclosed in claim 98, characterised in

- that the accessible data belonging to said rotational step is designed to be shown according to the rotational direction of the operating element; and
 - that said data shown is selectively selectable by depression or sideways tilting of
- 10 the control element.

100.

An operating device designed for use for the input of data and/or control of user functions in electronic equipment, e.g., electronic apparatus with or without connection
15 to a display screen, including electronic equipment such as mobile telephones, remote controls, mini-PC equipment, electronic equipment related to control functions in means of conveyance and transport, or an electronic device for use in such means of conveyance or transport, and where the operating device has an operating element that is centrally depressible, tiltable in four directions, and stepwise rotatable,
20 characterised in

- that marking the stepwise rotation of the operating element takes place with the aid of at least one first magnetic field formed between the operating element and an unmovable part in the operating device;
- that the stepwise rotation is detectable with the aid of a magnetic detector; and
- 25 - that tactile user function on depression or tilting of the control element is produced with the aid of another magnetic field between the unmovable part and a switch-actuating tilting cross that is controlled by the operating element.

101.

30 A device as disclosed in claim 95, characterised in that

- the magnetic detector is a magnetic switch or a Hall sensor.

102.

A device as disclosed in claim 100 or 101, characterised in

- 35 - that the tilting cross with its arms is designed, when tilted, to actuate the switch function of a respective switch in the operating device, the tilting cross being designed to be maintained in a neutral position with the aid of said additional

magnetic field and when the control element is tilted it overcomes the magnetic force of the additional magnetic field for tactile feedback.

103.

- 5 A device as disclosed in one or more of claims 100-102,
characterised in

- that the operating element, when centrally depressed, is designed to overcome a supplementary magnetic force produced between the tilting cross and a magnet mounted on a central pin on the operating element for tactile feedback, and to
10 actuate the switch function of a centrally arranged switch, the tilting cross being maintained in a neutral position during the central depressing movement with the aid of said additional magnetic field.

104.

- 15 A device as disclosed in one or more of claims 100-103,
characterised in

- that the respective switches are contact film-based switches.

Fig. 1a
(Prior art)

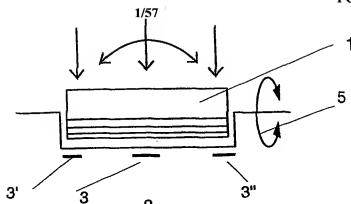


Fig. 1b
(Prior art)

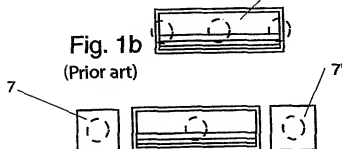


Fig. 1c
(Prior art)

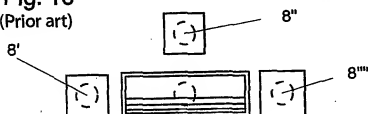


Fig. 1d
(Prior art)

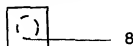


Fig. 1e
(Prior art)

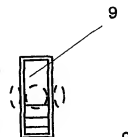


Fig. 1f
(Prior art)

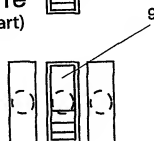


Fig. 1g
(Prior art)

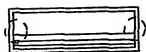


Fig. 1h
(Prior art)

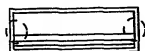


Fig. 1i
(Prior art)



Fig. 1j
(Prior art)

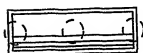


Fig. 1k
(Prior art)

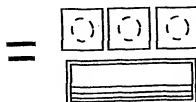
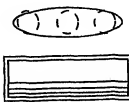


Fig. 1l
(Prior art)



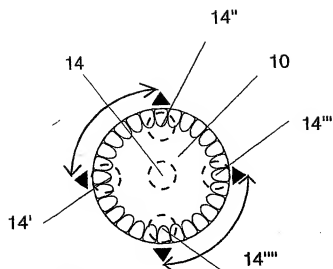


Fig. 2a
(Prior art)

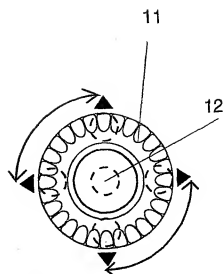


Fig. 2b
(Prior art)

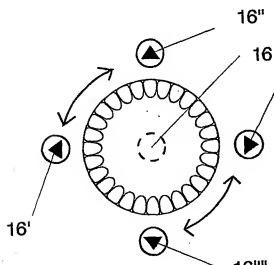


Fig. 2c
(Prior art)

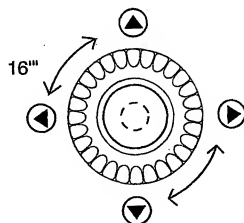


Fig. 2d
(Prior art)

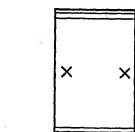
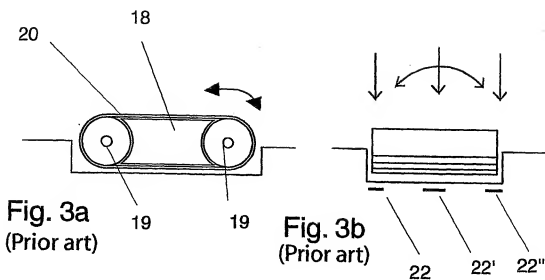


Fig. 3c
(Prior art)

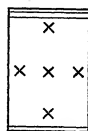


Fig. 3d
(Prior art)

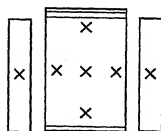


Fig. 3e
(Prior art)

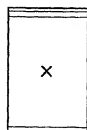


Fig. 3f
(Prior art)

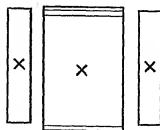


Fig. 3g
(Prior art)

27

Y4	1 abc	2 def	3 ghi
Y3	4 jkl	5 mno	6 pqr
Y2	7 stu	8 vwx	9 yz@
Y1	* .,!	0 /()	# ?+-
	X1	X2	X3

Fig. 4a
(Prior art)

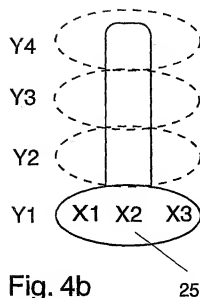


Fig. 4b
(Prior art)

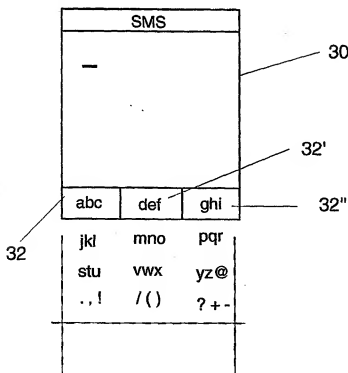


Fig. 4c
(Prior art)

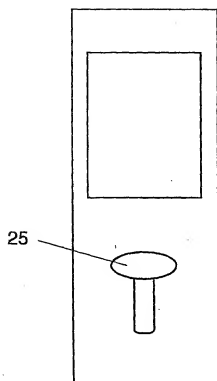


Fig. 5a

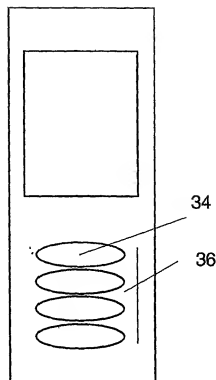


Fig. 6a

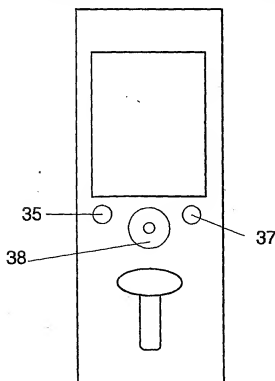


Fig. 5b

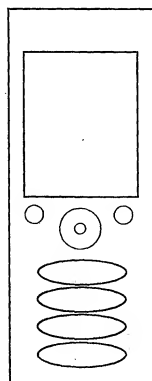
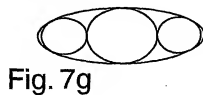
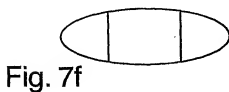
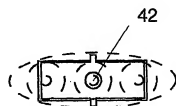
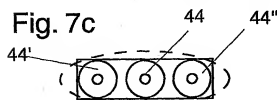
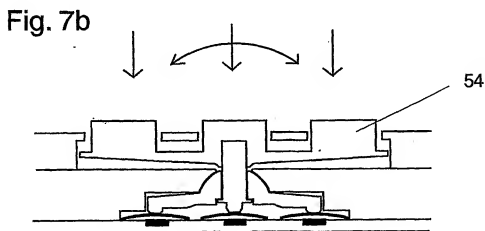
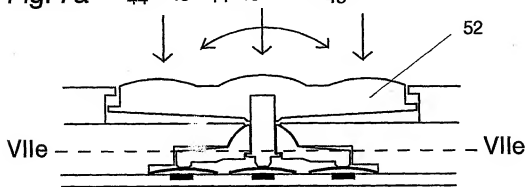
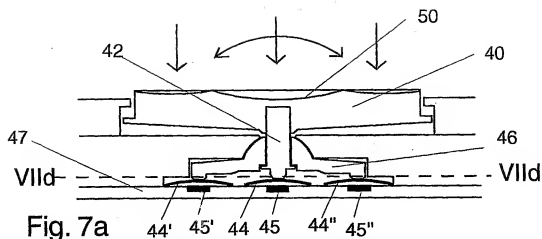
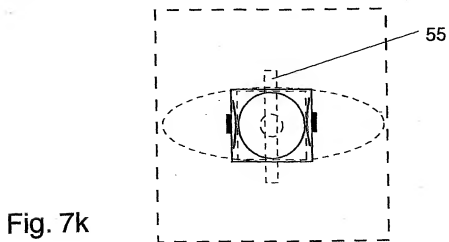
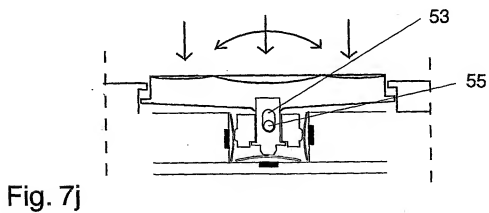
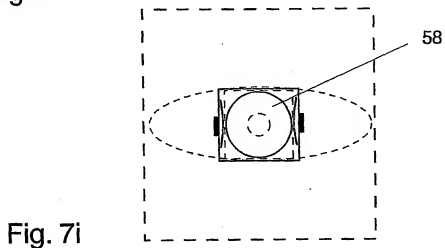
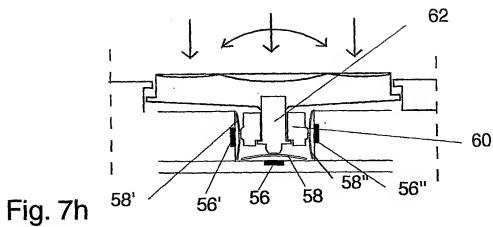


Fig. 6b





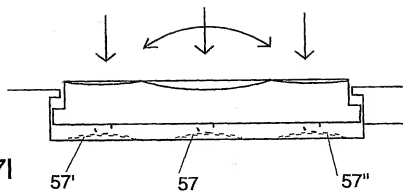


Fig. 7l

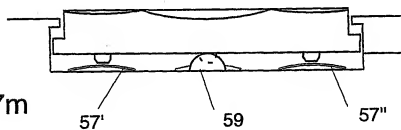


Fig. 7m

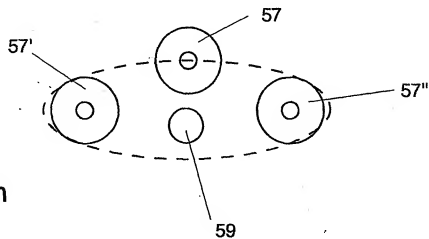


Fig. 7n

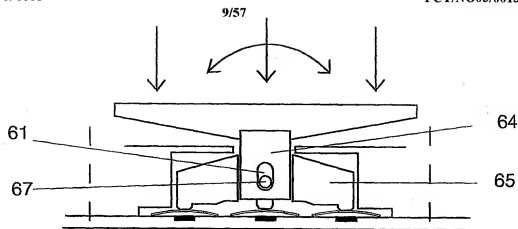


Fig. 8a

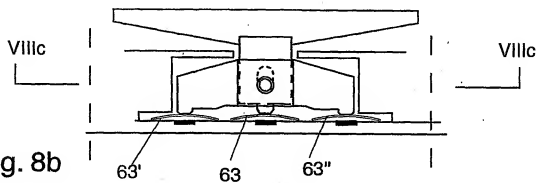


Fig. 8b

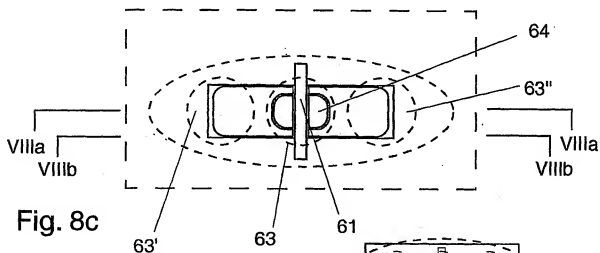


Fig. 8c

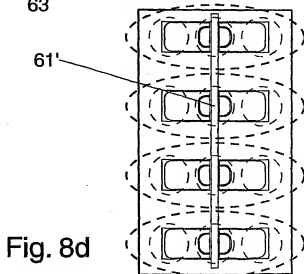
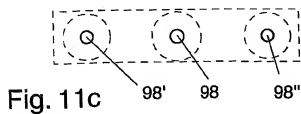
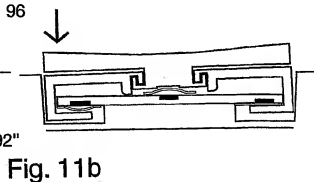
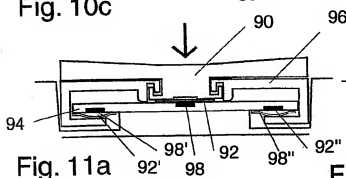
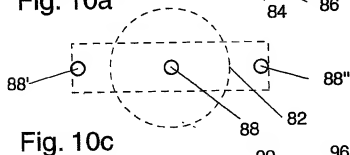
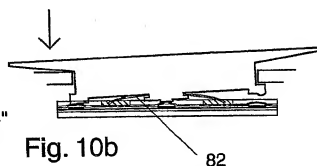
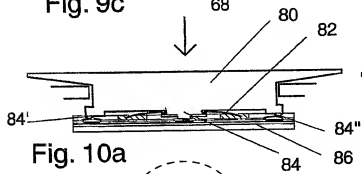
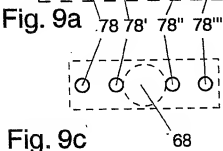
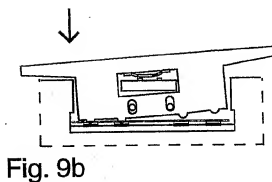
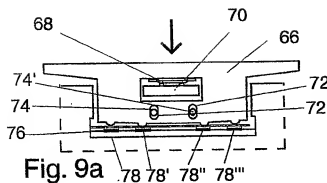
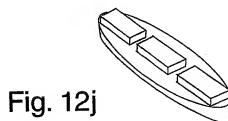
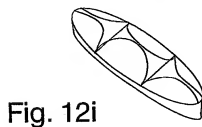
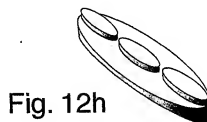
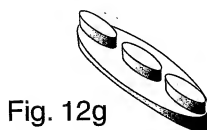
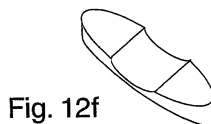
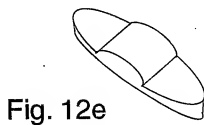
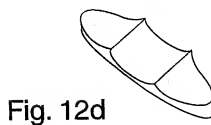
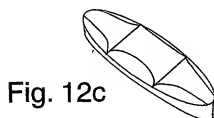
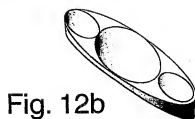
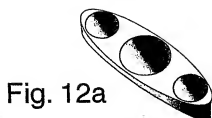


Fig. 8d





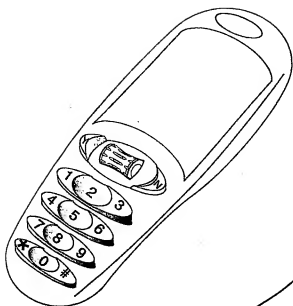


Fig. 13a

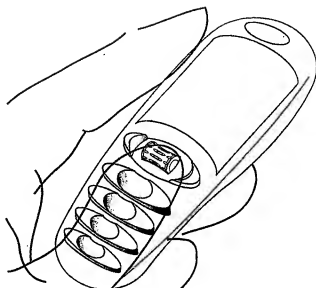


Fig. 13b

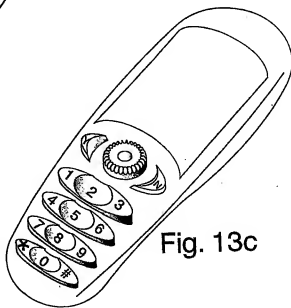


Fig. 13c

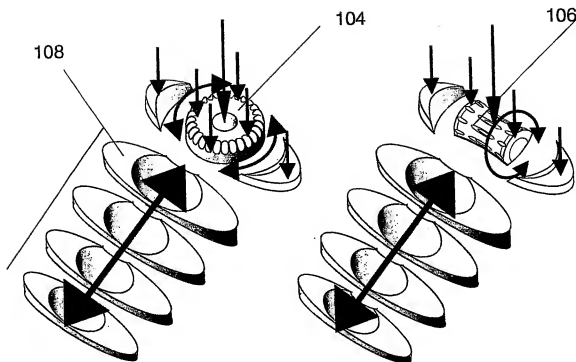


Fig 14a

Fig 14b

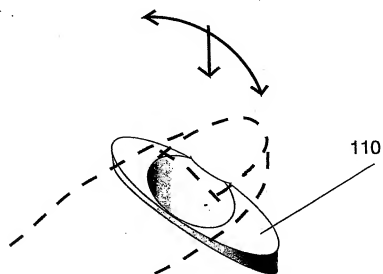


Fig 14c

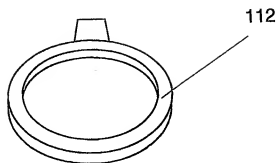


Fig. 15a

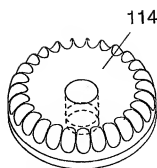


Fig. 15b

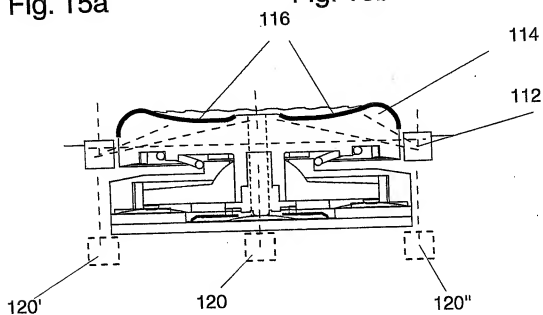


Fig. 15c

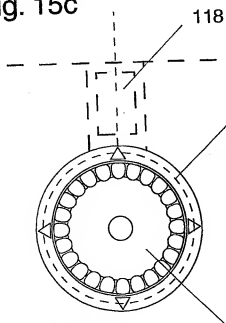


Fig. 15d

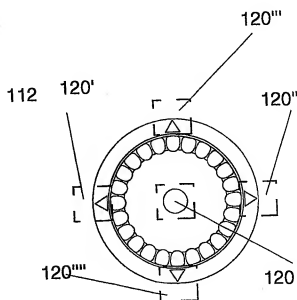


Fig. 15e

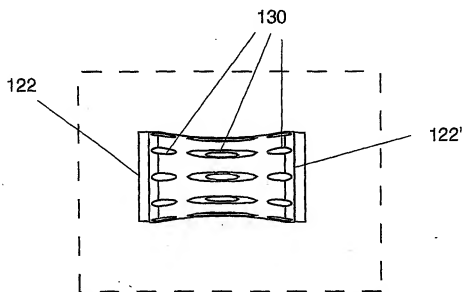
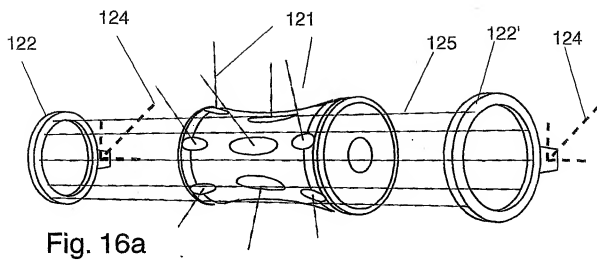


Fig. 16b

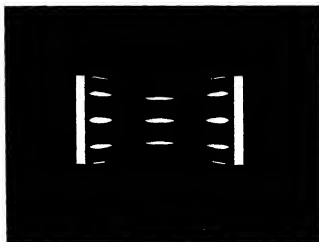
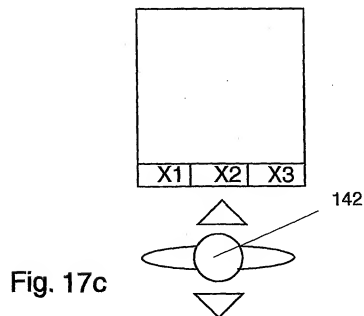
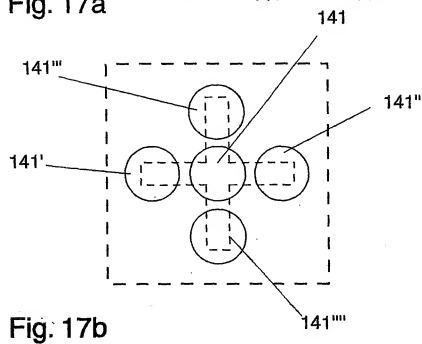
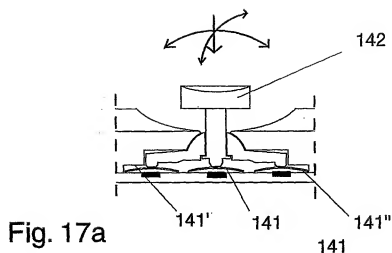


Fig. 16c



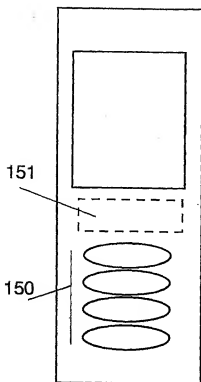


Fig. 18a

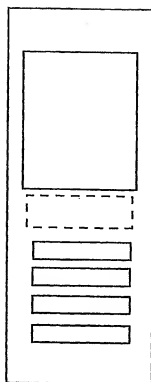


Fig. 18b

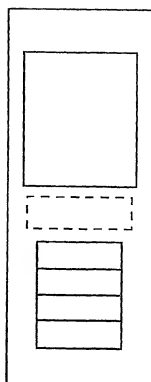


Fig. 18c

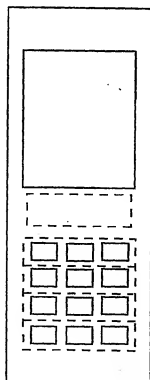


Fig. 18d

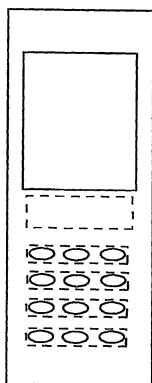


Fig. 18e

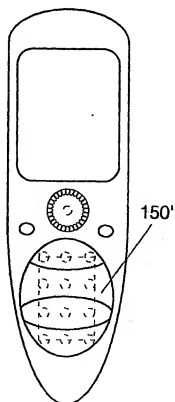


Fig. 18f

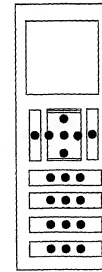
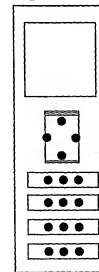
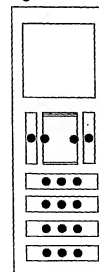
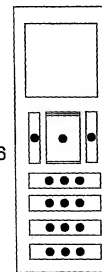
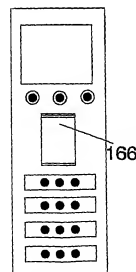
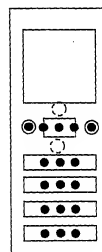
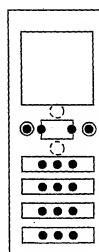
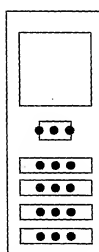
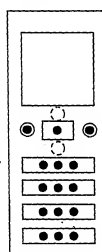
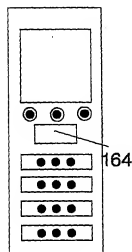
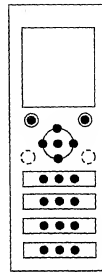
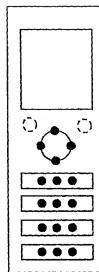
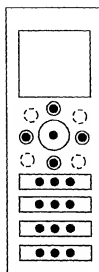
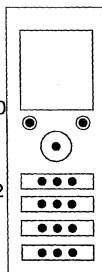
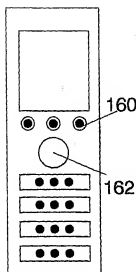


Fig. 19l

Fig. 19m

Fig. 19n

Fig. 19o

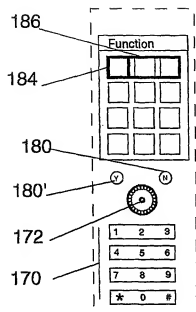


Fig. 20a

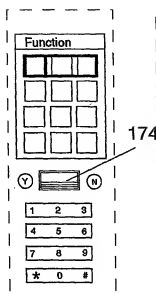


Fig. 20b

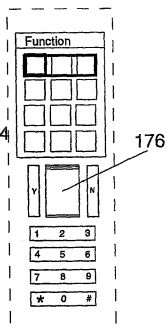


Fig. 20c

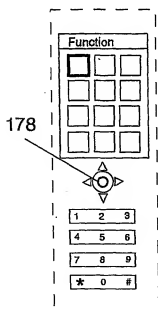


Fig. 20d

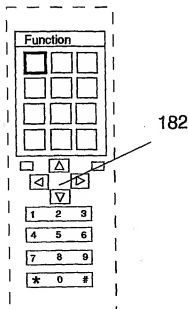


Fig. 20e

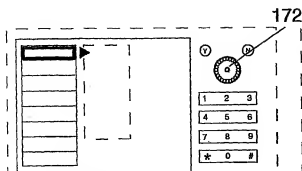


Fig. 20f

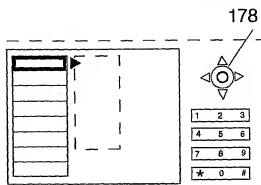


Fig. 20g

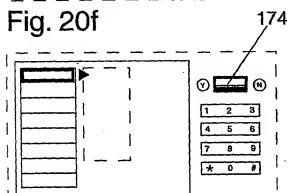


Fig. 20h

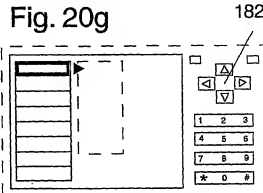


Fig. 20i

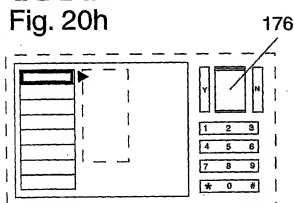


Fig. 20j

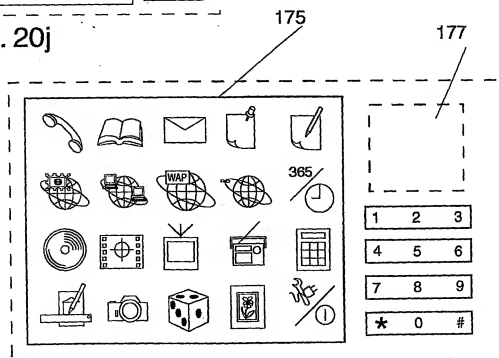


Fig. 20k

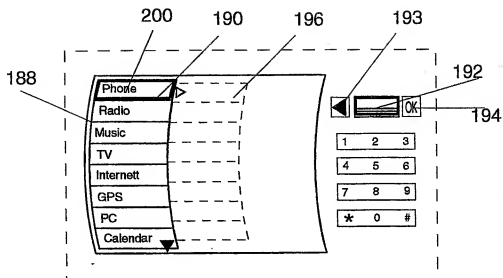


Fig. 21a

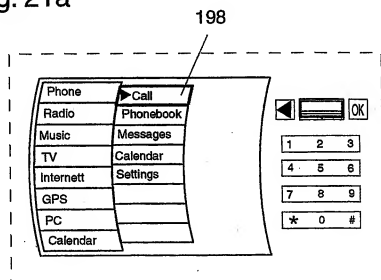


Fig. 21b

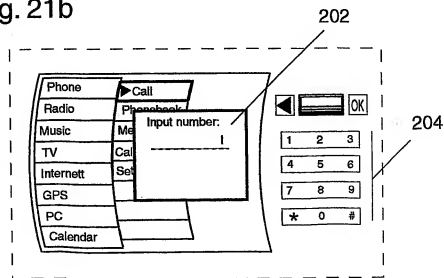


Fig. 21c

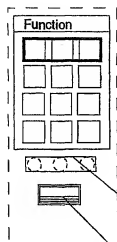


Fig. 22a

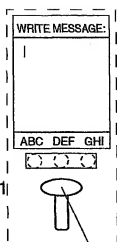


Fig. 22b

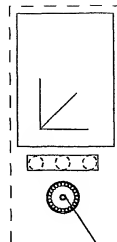


Fig. 22c

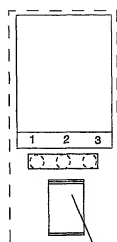


Fig. 22d

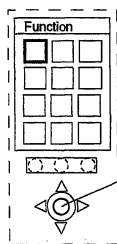


Fig. 22e

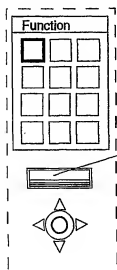


Fig. 22f

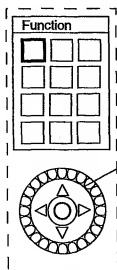


Fig. 22g

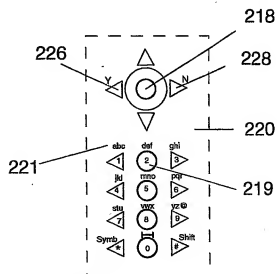
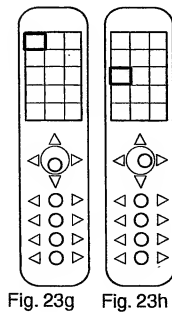
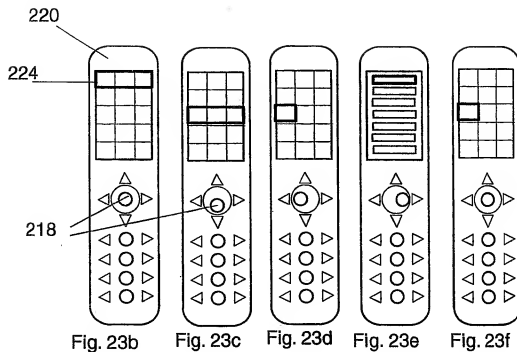


Fig. 23a

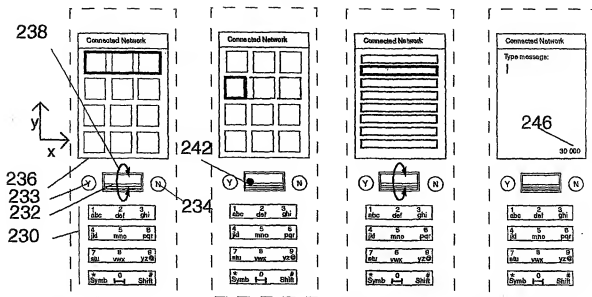


Fig. 24a

Fig. 24b

Fig. 24c

Fig. 24d

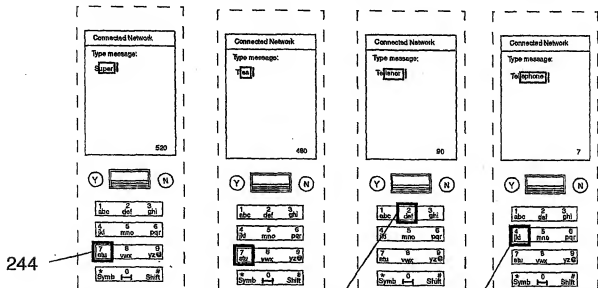


Fig. 24e

Fig. 24f

Fig. 24g

Fig. 24h

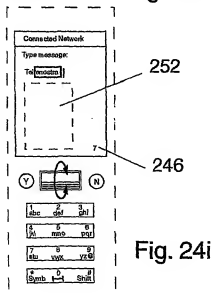
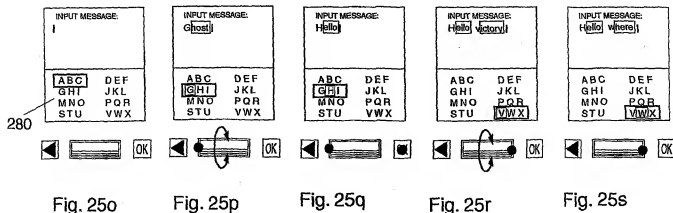
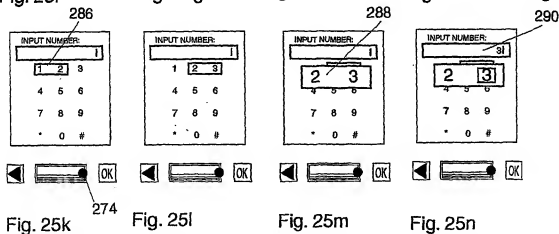
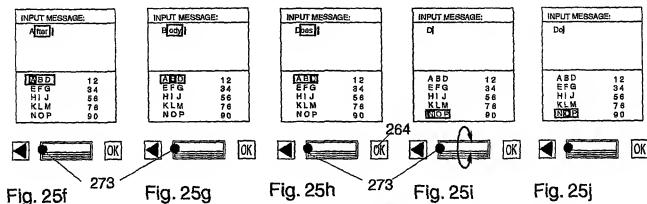
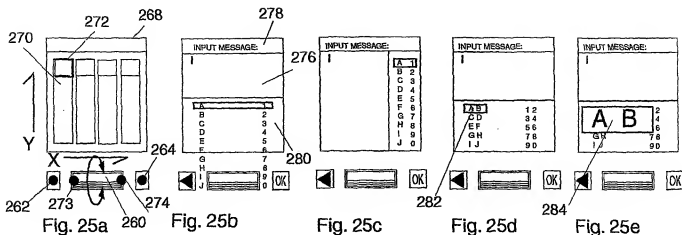


Fig. 24i



INPUT MESSAGE:	
Hello, where can I meet you?	
GHI	JKL
MNO	PQR
STU	VWX
..?	(/)

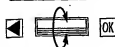


Fig. 25t

INPUT MESSAGE:	
Hello, where can I meet you?	
MNO	PQR
STU	VWX
..?	(/)
Send	Save



Fig. 25v

INPUT MESSAGE:	
I	
ABC	DEF



Fig. 26a

INPUT MESSAGE:	
I	
ABC	DEF
GHI	JKL
MNO	PQR
STU	VWX
Y Z	..?



Fig. 26b

INPUT MESSAGE:	
I	
ABC	DEF



Fig. 26c

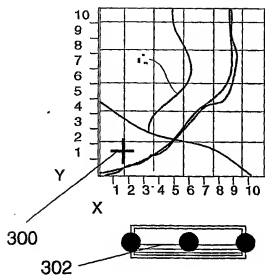


Fig. 27a

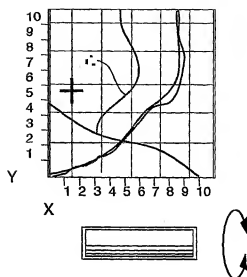


Fig. 27b

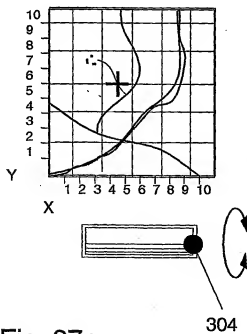


Fig. 27c

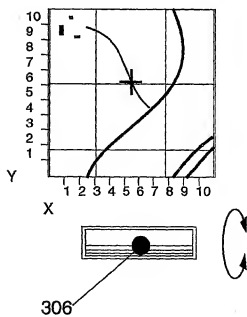


Fig. 27d

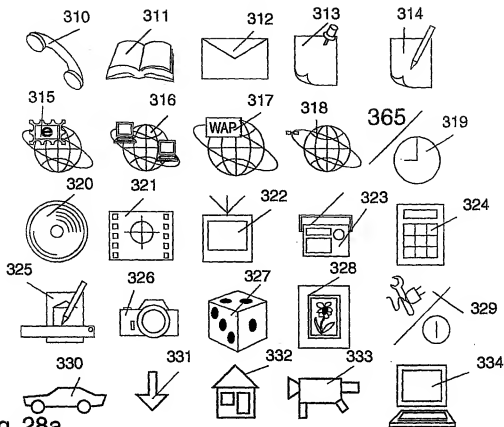


Fig. 28a

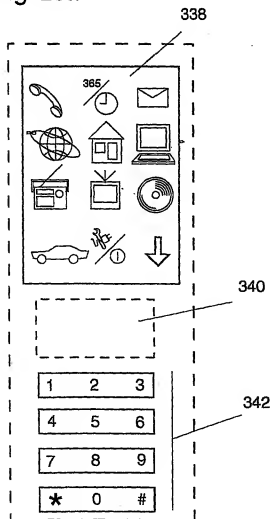


Fig. 28b

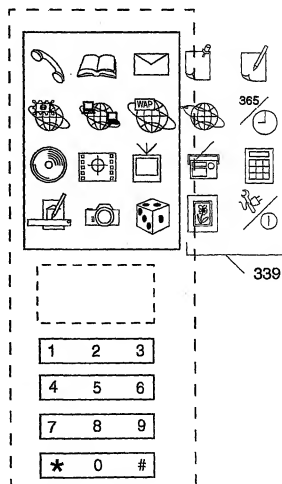


Fig. 28c

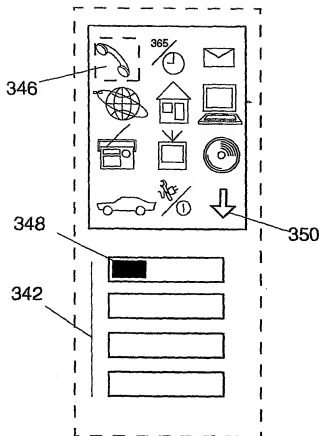


Fig. 29a

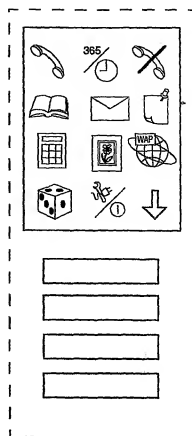


Fig. 29b

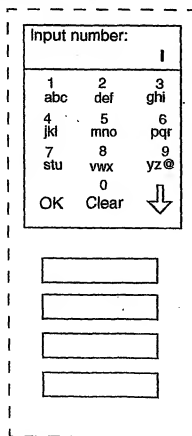


Fig. 29c

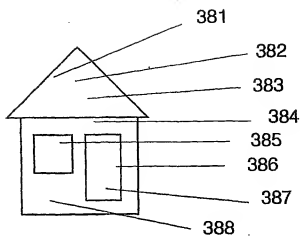


Fig 30a

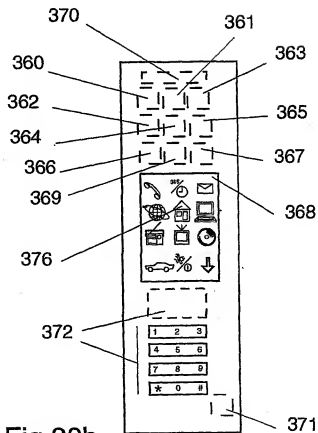


Fig 30b

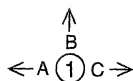
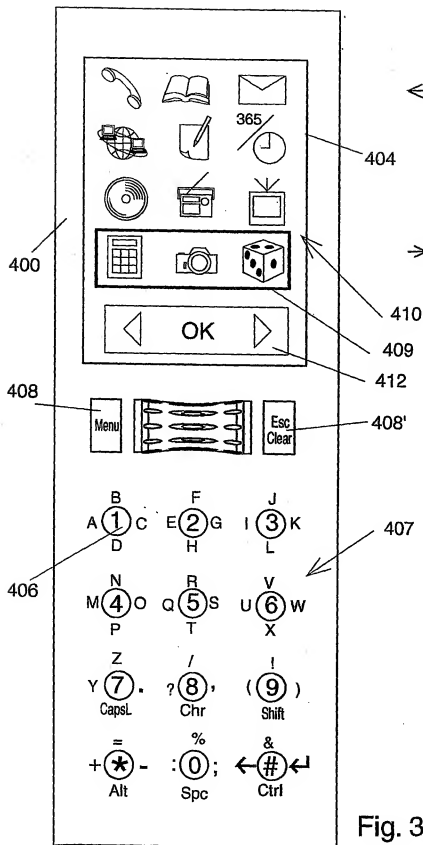


Fig. 31b

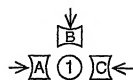


Fig. 31c

Fig. 31a

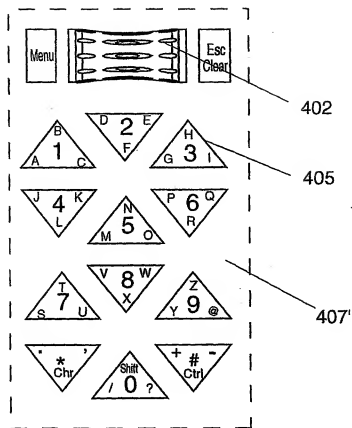


Fig. 32

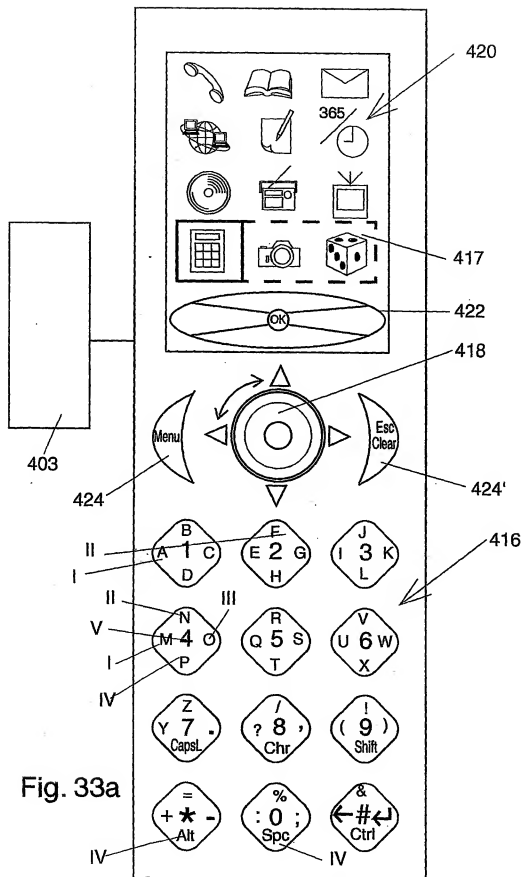


Fig. 33a

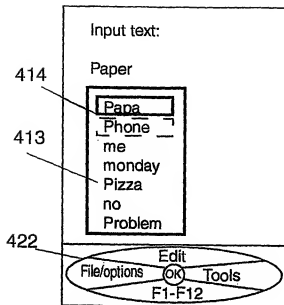


Fig. 33b

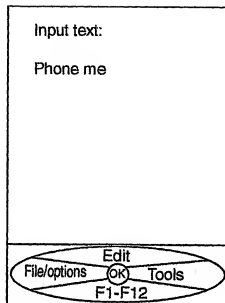


Fig. 33c

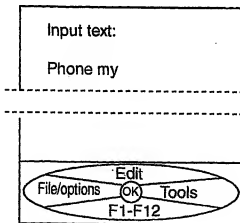


Fig. 33d

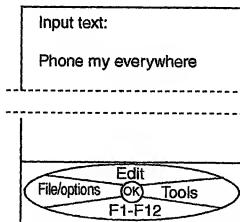


Fig. 33e

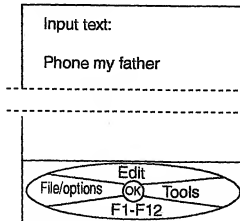


Fig. 33f

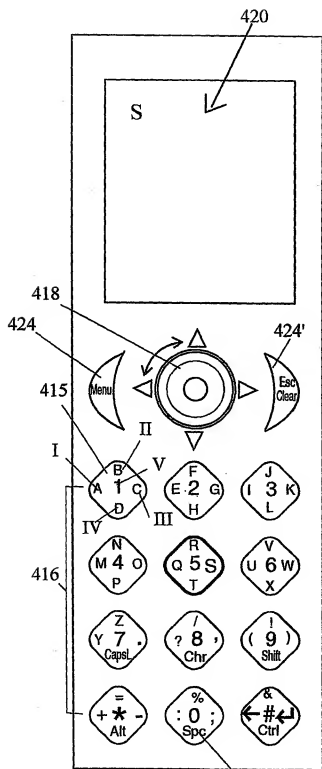


Fig. 33g

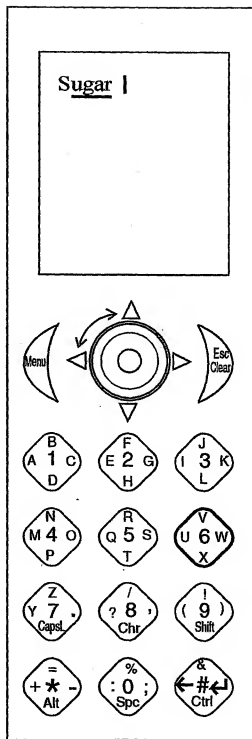


Fig. 33h

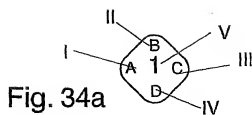


Fig. 34a



Fig. 34b

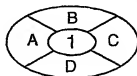


Fig. 34c



Fig. 34d

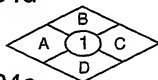


Fig. 34e

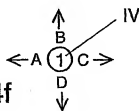


Fig. 34f



Fig. 34g

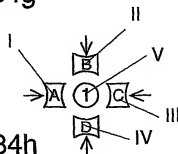
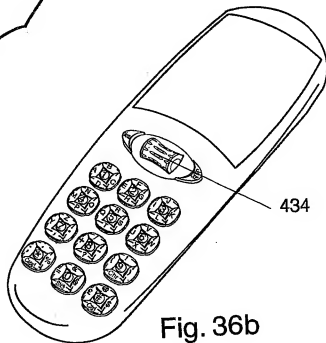
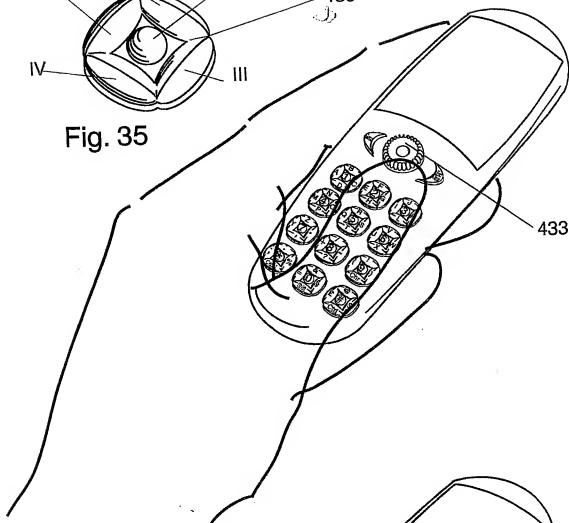
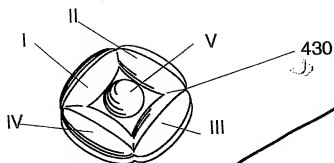


Fig. 34h



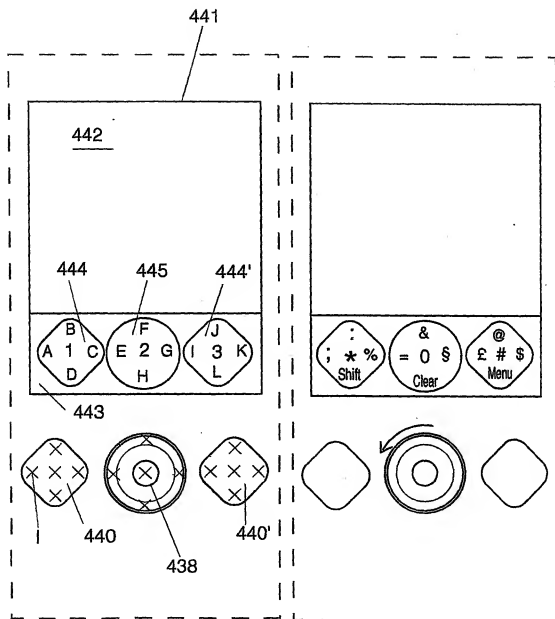


Fig. 37a

Fig. 37b

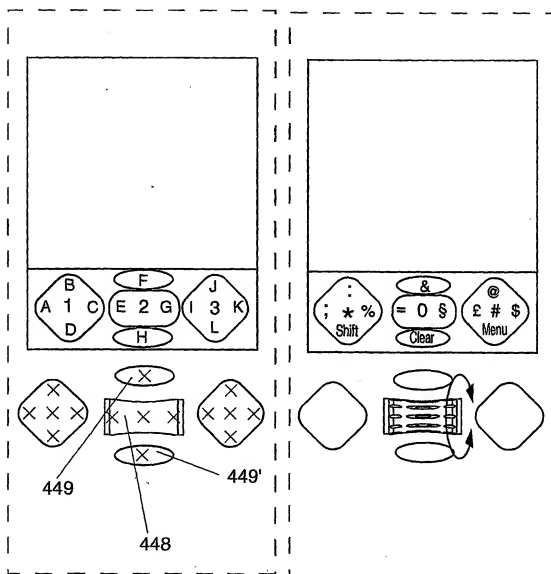
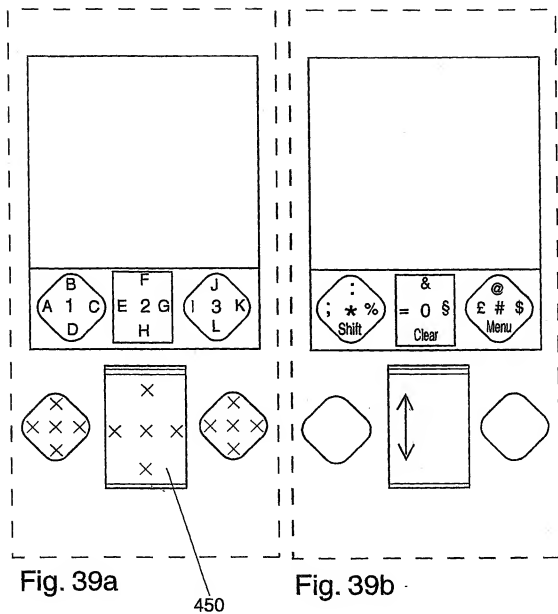


Fig. 38a

Fig. 38b



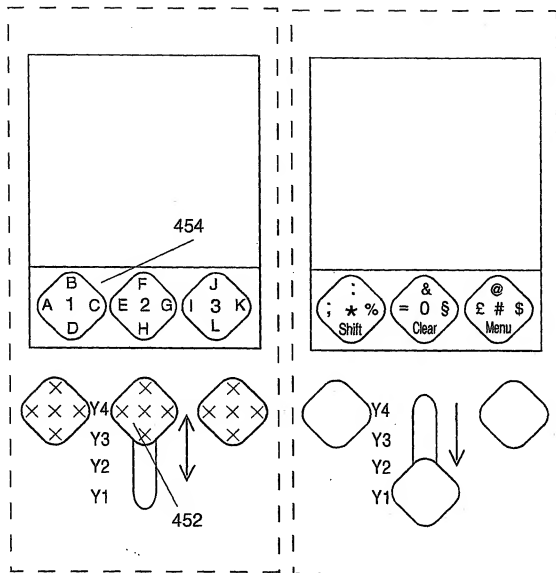


Fig. 40a

Fig. 40b

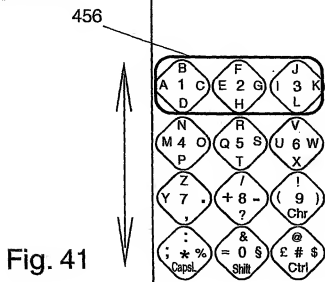
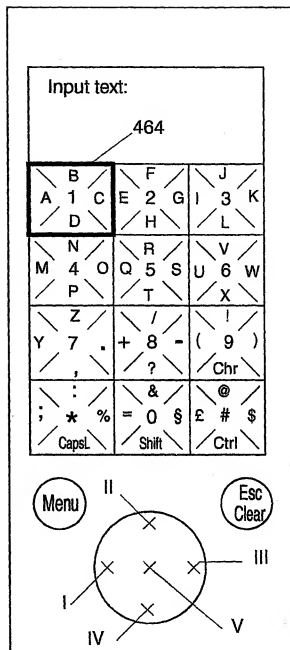
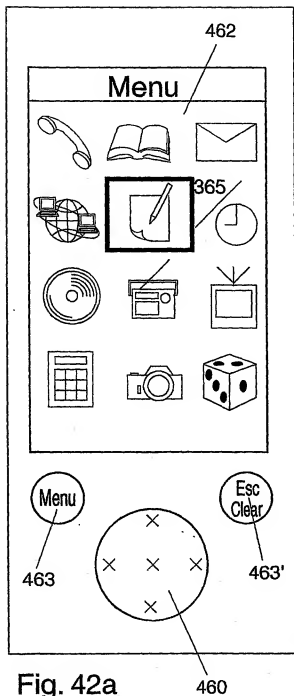


Fig. 41



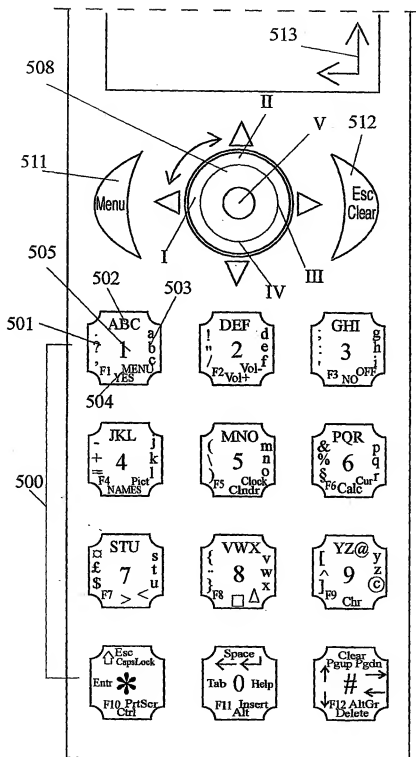


Fig. 43a

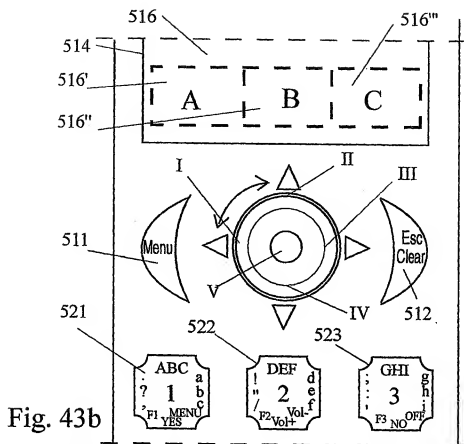


Fig. 43b

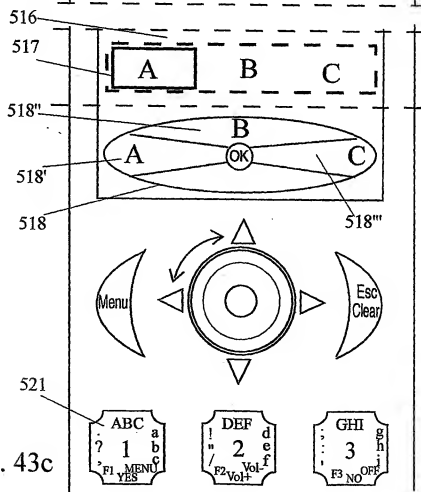
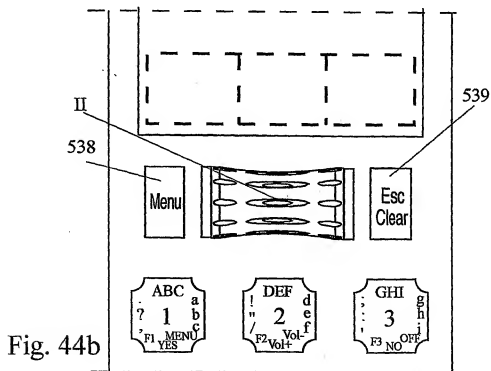
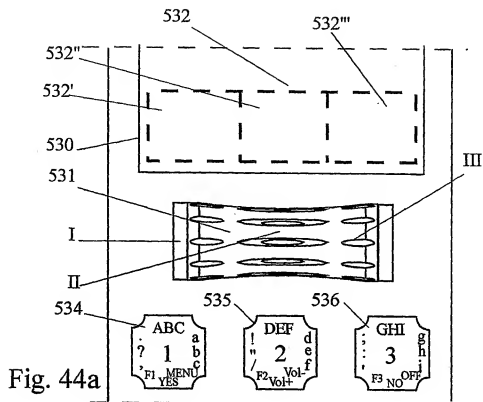


Fig. 43c



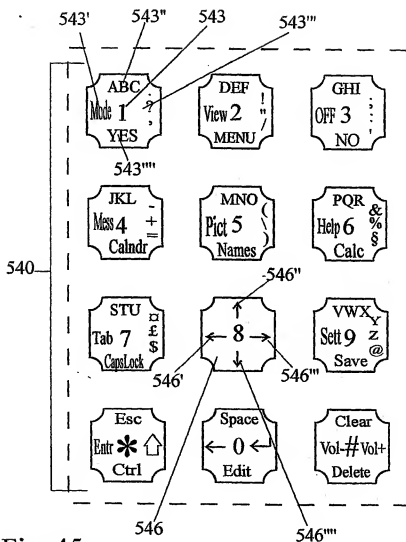


Fig. 45a

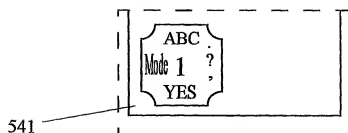


Fig. 45b

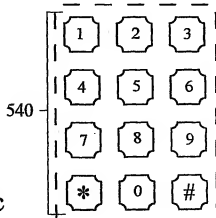
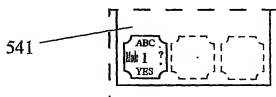
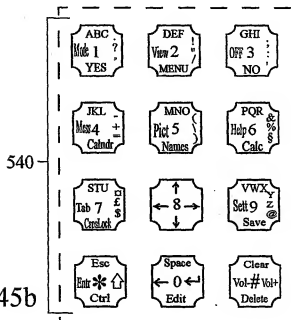


Fig. 45c

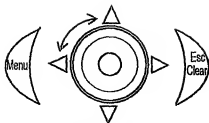
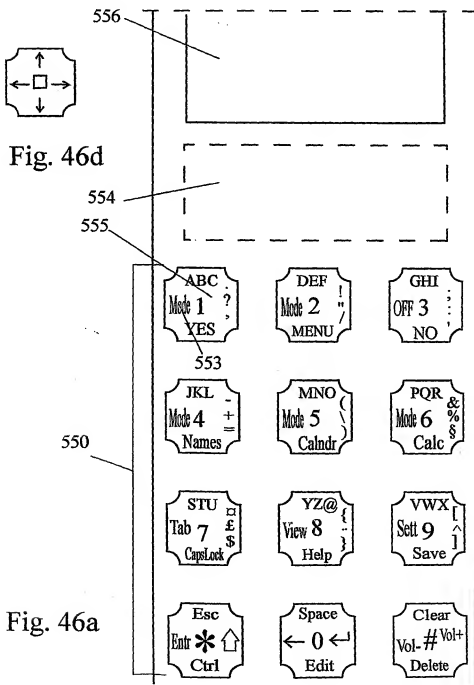


Fig. 46b



Fig. 46c



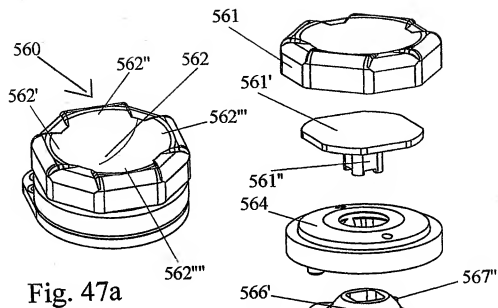
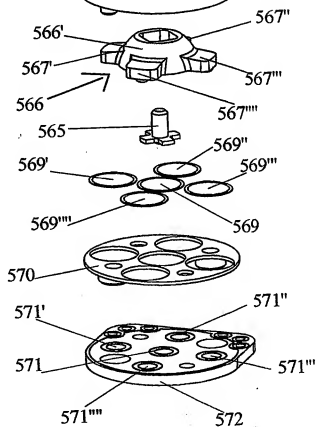


Fig. 47b



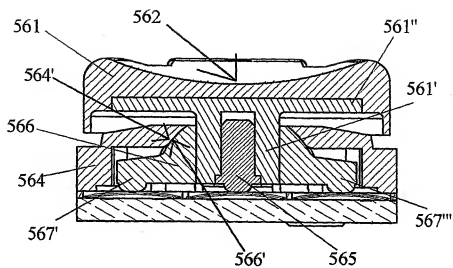


Fig. 47c

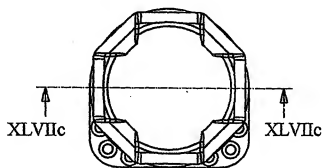


Fig. 47d

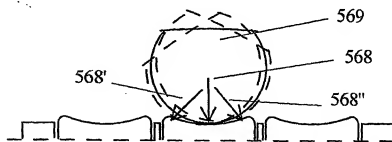


Fig. 48a

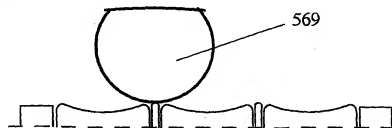


Fig. 48b

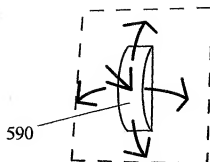


Fig. 49a

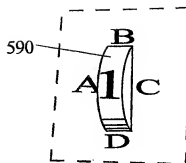


Fig. 49b

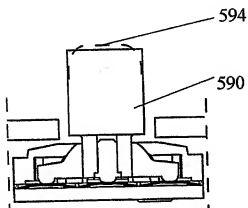


Fig. 49c

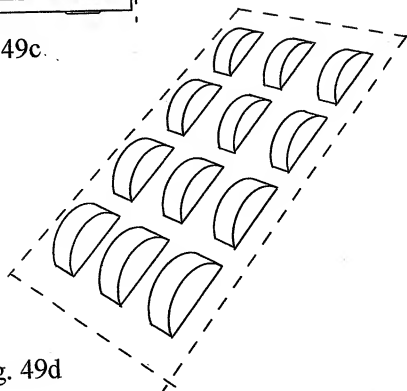


Fig. 49d

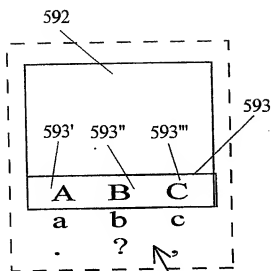


Fig. 49e

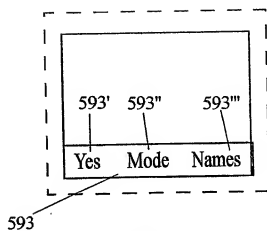


Fig. 49f

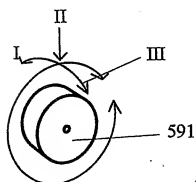


Fig. 49g

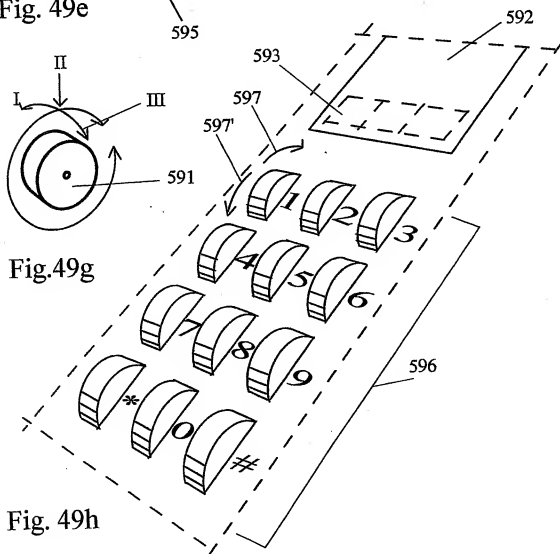


Fig. 49h

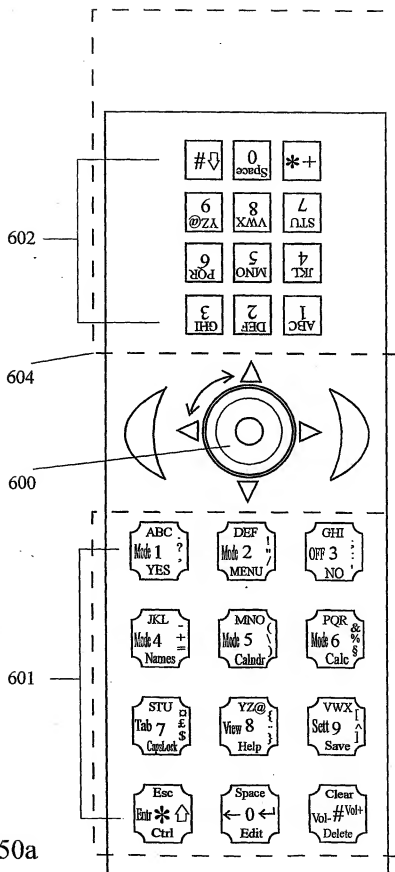


Fig. 50a

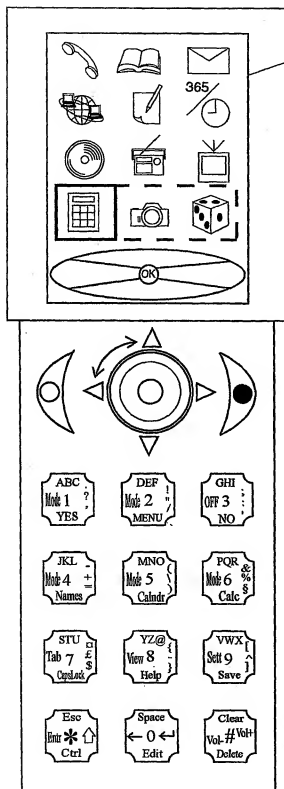


Fig. 50b

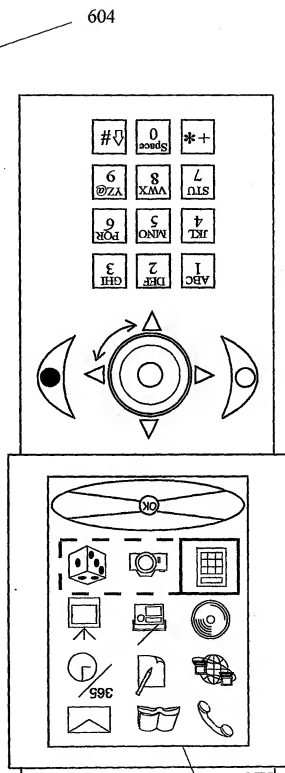


Fig. 50c

604

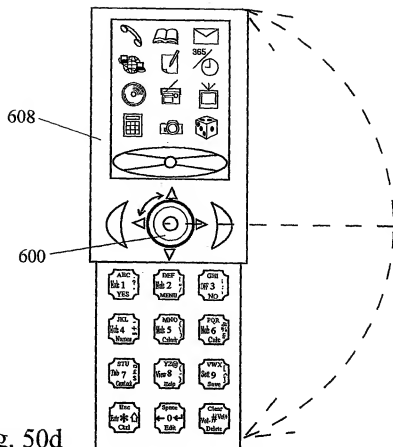


Fig. 50d

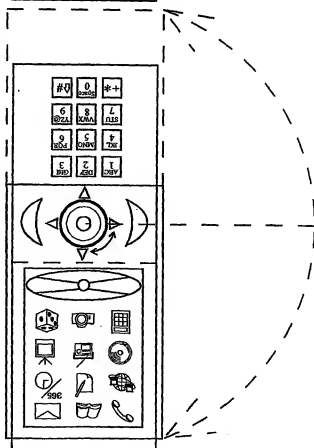


Fig. 50e

Fig. 51a

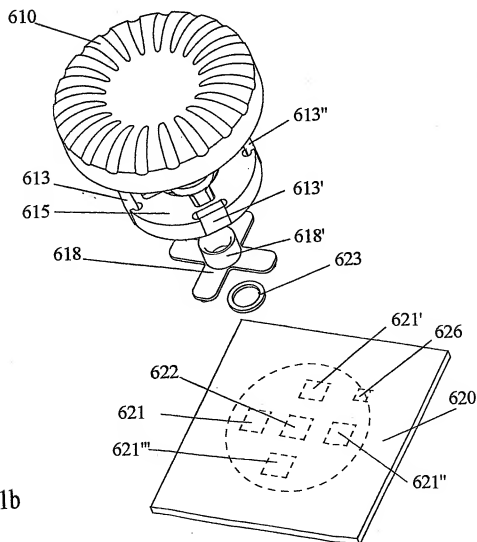
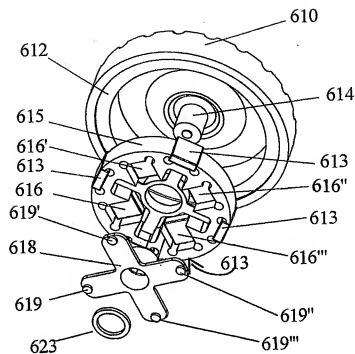


Fig. 51b

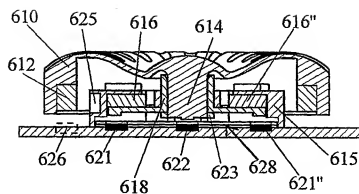


Fig. 51c

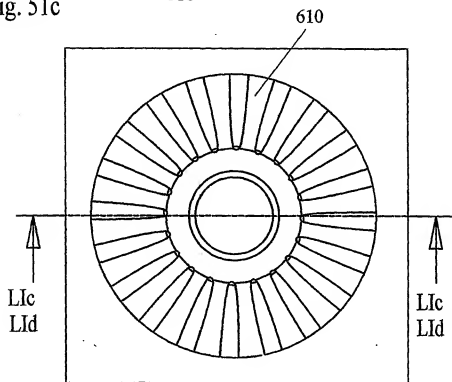


Fig. 51d

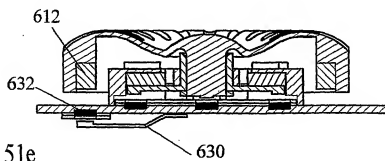


Fig. 51e

(19) World Intellectual Property
Organization
International Bureau



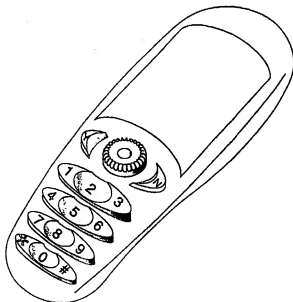
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- (72) Inventor; and
(75) Inventor/Applicant (for US only): **HANSEN, Benedict, J., M.** [NO/NO]; Schleppegrellsgate 28b, N-0556 Oslo (NO).
- (74) Agent: **LANGFELDT, Jens, F., C.**; Zacco Norway AS, P.O. Box 765, Sentrum, N-0106 Oslo (NO).
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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: SWITCHES, SYSTEM OF SWITCHES, AND INTERACTIVE SYSTEM FOR USE ON ELECTRONIC APPARATUS



(57) Abstract: An operating device for the input of data and control of user functions in hand-held electronic apparatus with or without a screen and apparatus that are remote-connected to a screen or display means and for control functions in means of conveyance and transport and electronic equipment associated therewith. The operating device is centrally depressible and sideways tiltable, and its user-contact portion consists of a one-piece surface for both tilting and depression. When used on an electronic hand-held apparatus, the invention provides the known key logic which, together with new to ergonomics and a user interface, forms new and user-friendly apparatus and functions.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 03/00130

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 3/033, G06K 11/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F, G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 0161637 A1 (BADARNEH, Z.), 23 August 2001 (23.08.01), page 14, line 33 - page 18, line 20; page 51, line 24 - page 64, line 2, figures 162-202, abstract --	1-9,14
Y	WO 0160650 A1 (BADARNEH, Z.), 23 August 2001 (23.08.01), page 1, line 1 - page 3, line 30; page 11, line 16 - page 12, line 24; page 25, line 25 - page 26, line 27, claims 1-52, abstract --	1-9,14
Y	WO 0231758 A1 (BADARNEH, Z.), 18 April 2002 (18.04.02), page 3, line 18 - page 5, line 22, claims 1-9, abstract --	1-9,14

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application on or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

9 October 2003

15-10-2003

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 03/00130

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6307537 B1 (Y. OOWADA), 23 October 2001 (23.10.01), claims 1-6, abstract --	1-9,14
A	WO 0141402 A2 (BADARNEH, Z.), 7 June 2001 (07.06.01), page 18, line 1 - line 36, claims 1-29, abstract --	1-9,14
A	WO 0135203 A1 (BADARNEH, Z.), 17 May 2001 (17.05.01), whole document --	1-9,14
A	WO 0034965 A2 (BADARNEH, Z.), 15 June 2000 (15.06.00), whole document -- -----	1-9,14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO03/00130**Box I** Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: **1-9, 14**

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

Continuation of Box II

This International Search Authority found multiple groups of inventions in this international application, as follows:

1. Claims 1- 9, 14 relate to an operating device for controlling user functions, where the device has a plug placed on the underside for switching control.
2. Claims 10- 13 relate to an operating device for controlling user functions, where the device has multiple plugs and axels.
3. Claims 15- 18 relate to an operating device for controlling user functions, where the device has a plate and a transparent touch part made of light carrying material.
4. Claims 19- 22 relate to an operating device for controlling user functions, where the device has a cylinder shaped light carrying touch part.
5. Claims 23- 25 relate to an operating device for controlling user functions, where the device has a cross formed tilt for function activation.
6. Claims 26- 31, 36- 43 relate to an operating device and system for controlling user functions, where the device has multiple combinations of switches and switch relating functions.
7. Claims 32- 35 relates to a handheld electronic device for controlling user functions, where the device has switch controls, tilt, screen navigation, rotating board, rotating cylinder and different types of buttons.
8. Claims 44- 50, 63- 64 relates to an interactive system for textual navigation in relation to a screen display, based on keystroke.
9. Claims 51- 54 relate to an interactive system for textual navigation in relation to a screen display, where the navigation and function inputs are made with the aid of a tilt and a multifunction switch.
10. Claims 55- 59 relate to an interactive system with a screen or display, a tilt and a switch. The system includes to independent keys for function control.
11. Claims 60- 61 relate to an interactive system including a screen or display and a tilt for activating data input or navigation, where the movements on the screen are related to the switch.
12. Claim 62 relates to an interactive system including a screen or display and a keyboard of 12 switches which are tilt able or press able.
13. Claims 65- 69 relate to a data input device and user functions control in a handheld device, where each device can activate at least one and at most five switching functions which they are marked to represent.

.../...

14. Claims 70- 75 relate to handheld electronic devices with display or screen connections, where each device can activate at least one and at most five switching functions, and one device with rotation or slide function for data navigation on a screen.
15. Claim 76 relates to a handheld device including a screen, a list of the most used data expressions for relating a finger press to a data expression, and giving a proposed expression in relation to priority data.
16. Claims 77- 78 relate to a handheld device with a screen for one hand control of multiple of devices centrally located and wherein the operating devices activates multiple switching functions, and a multifunction switch for manipulating the data machine functions.
17. Claims 79- 99 relate to an electronic control device with or without a screen and which includes choice possibilities for, with the aid of switching functions, activate lower stage functions and data elements.
18. Claims 100- 104 relate to an electronic operation device for controlling user functions and data input, wherein the rotations in the device are done with the aid of magnetic fields and detectors.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

06/09/03

PCT/NO 03/00130

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

06/09/03

PCT/NO 03/00130

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